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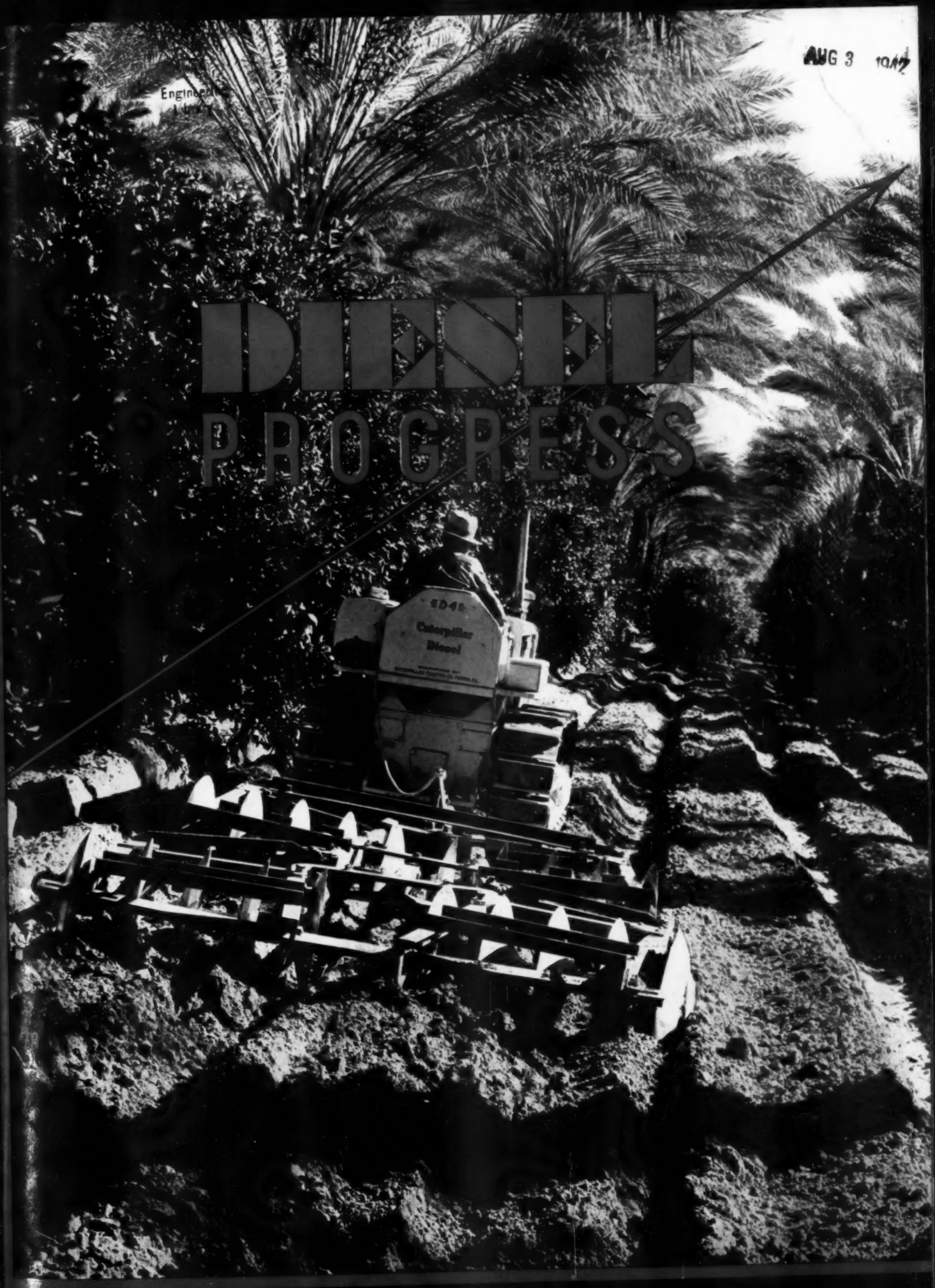
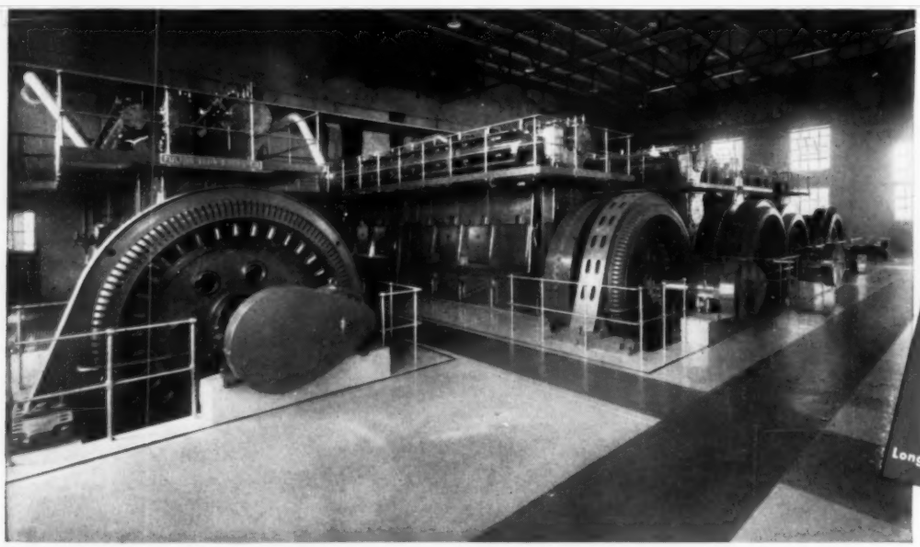


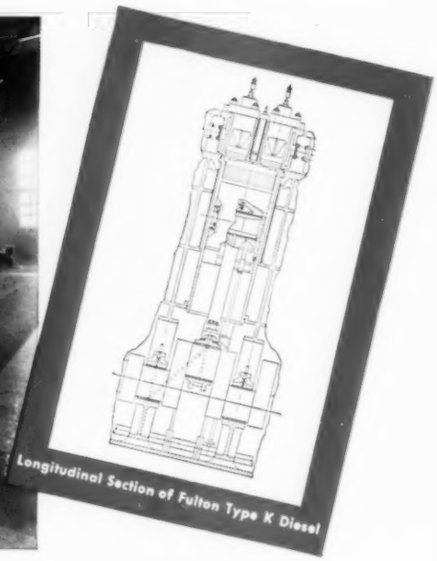
DIESEL PROGRESS

AUGUST, 1942

Rings Stay Free!

COMPRESSION STAYS UP





POCAHONTAS, IOWA, power plant where two new 1500-hp. Diesels, two 1000-hp. and one 750-hp. units are operating under the efficient management of Supt. Raymond Dobbs. All 5 engines are 4-cycle, solid injection Fultons. All are lubricated 100% with Texaco.

FIVE Fulton Diesels totalling 5750 hp. in this Pocahontas, Iowa, power plant are operating with high efficiency. They are lubricated 100% with TEXACO.

Free rings, minimum bearing and liner wear are results you, too, can expect when using *Texaco Algol or Ursa Oils.*

Because of the benefits Texaco brings—

More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

The outstanding performance that has made Texaco first in the stationary Diesel field, has made it first in the fields listed in the panel.

These Texaco users enjoy many benefits that can also be yours. A Texaco Lubrication Engineer will gladly cooperate . . . just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write to the home office of The Texas Company, 135 East 42nd Street, New York, N. Y.

Care for your Car ..for your Country

THEY PREFER TEXACO

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

Tune in the TEXACO STAR THEATRE every Sunday night—CBS

TEXACO

TEXACO Lubricants and Fuels

FOR ALL DIESEL ENGINES

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

DIESEL PROGRESS, for August, 1942. Volume VIII, Number 8. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., authorized March 27, 1940. Subscription rates: $5.00 per year, single copy, 50c.

DIESEL
GAS ENGINE
PROGRESS

REX W. WADMAN
Editor and Publisher

FRONT COVER ILLUSTRATION: Disking in date garden and grapefruit grove owned by Johnson, Inc., Indio, California, with a Caterpillar Diesel tractor. This equipment harrows 2½ acres an hour, working nine hours on $1.11 worth of fuel.

TABLE OF CONTENTS ILLUSTRATION: Caterpillar Diesel tractor and hyster arch bringing in 16,000 ft. of logs per hour for the Feather River Lumber Company of Spring Garden, California.

DIESEL PROGRESS for August 1942. Vol. VIII, No. 8. Published monthly by Diesel Engines, Inc., 2 West 45th Street, New York, N. Y. Tel. MUrray Hill 2-7333. Subscription rates: $5.00 per year, 50c per copy.

HEYWORTH CAMPBELL
Art Director

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DIESEL PROGRESS

REX W. WADMAN, Editor and Publisher

A Tribute To Our Generous Navy

WHEN, during the recent short-lived defense era, the United States Navy first awarded its "E" for excellence to co-operating industries,—it literally opened its heart in a most generous gesture and welcomed into its inner family circle those toilers in industry who produced the best and the most in record time.

Objectively we think of the United States Navy as a vast collection of fighting ships and armament. In fact, our Navy is comprised of real flesh-and-blood men whose training has prepared them to do the world's best fighting job with the world's best fighting tools under the standard of the finest ideals. Such is our Navy, and its history is replete with fine tradition—records of sacrifice and devotion to duty—written by big-souled men who hold character and country above life itself.

It was the spirit of cooperation and constant striving for perfection among our Navy personnel that gave birth to the Navy "E" back in 1906; an honor conferred on the fleet unit showing the highest degree of excellence in achievement. It was a coveted prize—the winning of which required the wholehearted cooperation of every man attached to the successful unit. It was a family rite—the Navy's cherished manner of saying to its own — "Well Done."

Now, this great honor is made available to those industries where the esprit de corps is such as to reflect excellence of quality and speed in producing what the Navy needs, and we gratefully acknowledge the liberal portion of Navy "E's" awarded to the Diesel and associated industries. The Navy has a way of making every individual feel that he is henceforth a part of the great Navy family. It is the mark of great souls whose spirits move through the rank and file of our glorious Navy—the implementation of generosity—and we say to the Navy — Splendid, Splendid!

Rex W. Wadman

George W. Codrington delivering his acceptance speech. Commander C. S. Isgrig is seen right of the podium.

On the speakers' platform at the GM Cleveland Diesel Division Navy E ceremonies were Navy, State, and City dignitaries and a number of captains of industry.

NAVY E TO GENERAL MOTORS CLEVELAND DIESEL DIVISION

CLEVELAND, Ohio, July 3: Cleveland Diesel Division of General Motors was today recognized for its proficiency and speed in production for the United States Navy. At a splendidly organized outdoor ceremony, the prized Navy E pennant was presented by Admiral Wat T. Cluverius, U.S.N. retired, to George W. Codrington, general manager of the Cleveland Diesel Division and vice president of General Motors. Commenting on recent bad war news, Admiral Cluverius went on to say, "But I saw here this morning as I went through this plant that one thing which is to lift us out of the depths of despair. I saw a spirit at every machine that will not be denied . . . the spirit of victory! I bring you the thanks of the men of the fleet, the men who go down under in the finest submarines in the world." . . . "I have known your work for years and it has never let us down." . . . "We are the peers of the world in Diesel engined ships." Mr. Codrington, in a short response, thanked Admiral Cluverius for the high honor—then casting his notes aside, he said, "And now I want to say something to you fellows who have been with me for the last 25 years . . . something in my own way . . . let's get the job done . . . in our own way . . . we will, won't we?" To which the workmen responded with rousing cheers. Commander C. S. Isgrig, U.S.N., presented the Navy E insignia to William Rossow, 30 year veteran employee who accepted the "E" lapel buttons for 2,100 men and women workers.

The Division's own thirty piece band provided stirring martial music. Gov. John W. Bricker of Ohio and Frank J. Lausche, Mayor of Cleveland, made short, appropriate addresses.

Admiral Wat T. Cluverius presenting the Navy E burgee to Mr. Codrington. James Melton, master of ceremonies, is right of the microphone.

"GEN. MacARTHUR" LEADS

A ROUNDUP OF WEST COAST FISHER CONSTRUCTION FOR 1942

CONVERSION of over 300 Pacific Coast fishing, commercial and pleasure craft, 85% of which are Diesel propelled, to various auxiliary craft for the Army and Navy left the fishing fleets somewhat depleted as to "boatpower" and most builders in the Pacific Northwest had a slight case of jitters in January when contemplating the 1942 season.

Since then over 100 splendid wood and Diesel engined fishing craft have been turned out on the Coast and at Tacoma, where twelve busy boatyards annually set up new records with their output. Seventeen of the twenty Giant-type Purse seiners, built in the West in 1942, have been delivered or are well along to completion. And the beautiful seiner, *Gen. MacArthur,* leads the fleet!

As a matter of record, the smaller shipyards in Tacoma Harbor will, in 1942, turn out the largest number, the largest total tonnage and the largest dollar volume of wood and Diesel vessels on record.

Out of every year's output of fishing vessels, there is always one that seems to get the lucky breaks, seems to be bigger, more beautifully decorated, better equipped and, as the owner comes to take it away, the sun always performs most splendidly, at the proper time, for a good pictorial record. Fishermen believe strongly in Lady Luck. Most of them are deeply religious. The Portuguese build Chapels right aboard their ships.

Below: The beautiful new Diesel purse seiner, "Gen. MacArthur" is the largest giant type built on Puget Sound in 1942. Right: The "MacArthur" carries this 250 hp. Atlas Diesel for propulsion.

View of the Arthur" galley

Left to right, John Peterson, President, Peterson Boatbuilding Company; Capt. Cardinelli and George Peterson, assistant to John Peterson, aboard the "MacArthur" during trial runs.

View of the completely appointed "MacArthur" galley.

So, it is fitting that this element of good luck and gambler's chance, that can make or break a fisherman financially, finds its symbolism in 1942 in the name of a famous American—General Douglas MacArthur.

The beautiful new purse seiner, *Gen. MacArthur,* whose home port is San Francisco now, carries the banner for the 1942 Tacoma fishing fleet, and for her builder, the Peterson Boatbuilding Co. Her owner, Capt. Vincent Cardinelli of Pittsburg, California, chose the most perfect day of summer, 1942, on Puget Sound, for the journey down the Coast to San Francisco Bay, and the final touch of a good send-off came when the crew of the new seiner, *Pearl Harbor* decided to make the run down the Coast at the same time. So it is, "Remember Pearl Harbor and *Gen. MacArthur.*"

The *Gen. MacArthur* is of typical douglas fir construction, with double ribs and one-piece keel, heavy planking and machinery space placed far forward, directly below the deckhouse and crew's quarters, to give the entire after part over to fish holds and fuel tanks. The Petersons, father John and son George, gave the hull those choice, rare Scandinavian

touches that help keep this ingenious race in the Diesel fishing vessel business and their output as sturdy as a battleship.

The ship is 85 ft. x 22 ft. x 11 ft. overall, with a net tonnage of 61 and 131 gross tonnage, and is powered with a 250 hp. Atlas Diesel engine of trunk-piston, overhead valve design, with a 3 kw. Westinghouse generator belt driven off the flywheel. Driven through a clutch, is a 3 bladed Doran bronze propeller.

She carries a 110 volt, 180 amp. hr. Willard battery set, a Fisher direction finder, powerful searchlight, and an elaborate lineshaft drive for the auxiliaries and deck machinery.

Two centrifugal pumps for circulating seawater through the holds, fire and bilge use, interconnected through an elaborate piping layout and Crane valves, a powerful cargo winch, and an anchor windlass forward, are all driven off the lineshaft, which is chain driven from the main engine, just ahead of the clutch.

The *Gen. MacArthur* is the first seiner with an extra gurdy, for pursuing the stem corks and stem line, enabling more rapid handling of the seine in action. The anchor windlass carries 75 fathoms of cable and 70 fathoms of ¾ in. chain. Two 450 lb. anchors are carried.

Another touch is the twin 250 watt spotlights placed in the bow to facilitate night work. She also carries bin boards for tuna and will alternately fish for sardines and tuna. She carries a 2 ft. x 10 ft. beam skiff, largest ever fitted on a local seiner, and a 4 ft. x 10 ft. dinky.

Crew quarters are beautifully done in mahogany, with the usual de luxe accommodation for twelve. The galley is a masterpiece of white enamel, plastic flooring, porcelain double sink, oil range, and York Ice Machine in a large box, for both cold and frozen storage. A two way radio set and a picture of General Douglas MacArthur completes the galley adornment.

Peterson Boatbuilding also completed the 82 ft., 220 hp. Atlas-powered seiner *Tidings* for Lee and LaVerne Wakefield and an 87 ft. x 22 ft. hull underway for fall sale.

Across the harbor is the Marine View Boat Building Co., operated by Peter Peterson, which, in 1942, turned out to be the largest builder of fishing vessels of all types of any yard on the Pacific Coast. Leader of their fleet was the *Pearl Harbor,* 80 ft. x 20 ft. seiner with a 250 hp. Atlas Diesel, originally built for John Brescovich, prominent owner, and resold to the Red Rock Fisheries of San Francisco. The *Pearl Harbor* is practically a replica of the other large vessels built here this season.

Other seiners from Marine View Boat Building Co. include the *City of Seattle,* 81 ft. x 21 ft. x 10 ft. with a 240 hp. Washington Diesel; the *Westward,* 80 ft. x 21 ft., with a 220 hp. Atlas Diesel for Nels Folkestad and Associates; a 65 ft. x 16 ft. x 8½ ft. halibut boat for Berger Edwards with a 100 hp. Washington Diesel; a 47 ft. x 13 ft. trawler with 45 hp. Atlas Diesel, also for Berger Edwards; the *Trade Wind,* a 77 ft. x 20 ft. x 9 ft. seiner with a 240 hp. Washington Diesel, and Willard battery, for Hans Michaelson of Bremerton, Wn.; the *Platinum,* an Alaska halibut boat 60 ft. x 16 ft. x 8½ ft. with a 75 hp. Atlas Diesel; an 81 ft. x 21 ft. x 10 ft. seiner for Ole Edwards and A. Anderson of Seattle, to have a 200 hp. Cooper Bessemer Diesel, and, lastly, now underway, two 84 ft. seiners for John Brescovich of Tacoma, each powered with a 240 hp. Washington Diesel. A whole fishing fleet from just one and only one shipyard!

"Oceanic," purse seiner built by Pacific ... g Co. of Ta...

The giant type purse seiner, "Pearl Harbor," built by Marine View Boat Building Co., is powered with a 250 hp. Atlas Diesel.

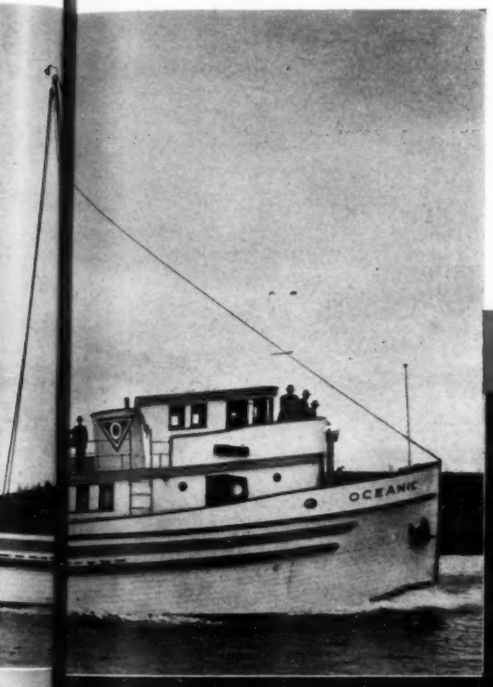
At the Port of Tacoma docks, the new shipyard of Pacific Boatbuilding Co. turned out five important giant-type seiners, leading off with the *America,* now chartered to P. E. Harris Co. of Seattle, which is 81 ft. x 21 ft. x 10.6 ft. overall and carries a 250 hp. Atlas Diesel, lineshaft drive, crew's quarters for twelve, 3 kw. Westinghouse generators and a 110 volt Willard battery set. She is owned by John Skansie of Gig Harbor. Next is the *Victory,* an 80 x 21 footer, with a 250 hp. Atlas Diesel, and the *Oceanic,* both owned by the Oceanic Fisheries, and of identical dimensions and the same Atlas Diesels; the *Cape Flattery,* 2 ft. shorter, for Sverre Jangard, Seattle, carries a 220 hp. Atlas Diesel, and the *Corregidor,* an 82 ft. x 21 ft. x 11 ft. seiner carries a 250 hp. Atlas Diesel.

No annual Diesel marine roundup on Puget Sound is complete without clocking the activities of the giant Foss Tug and Launch Company, whose busy shipyard at Tacoma keeps all the wooden tugs and barges in that fleet repaired and re-powered.

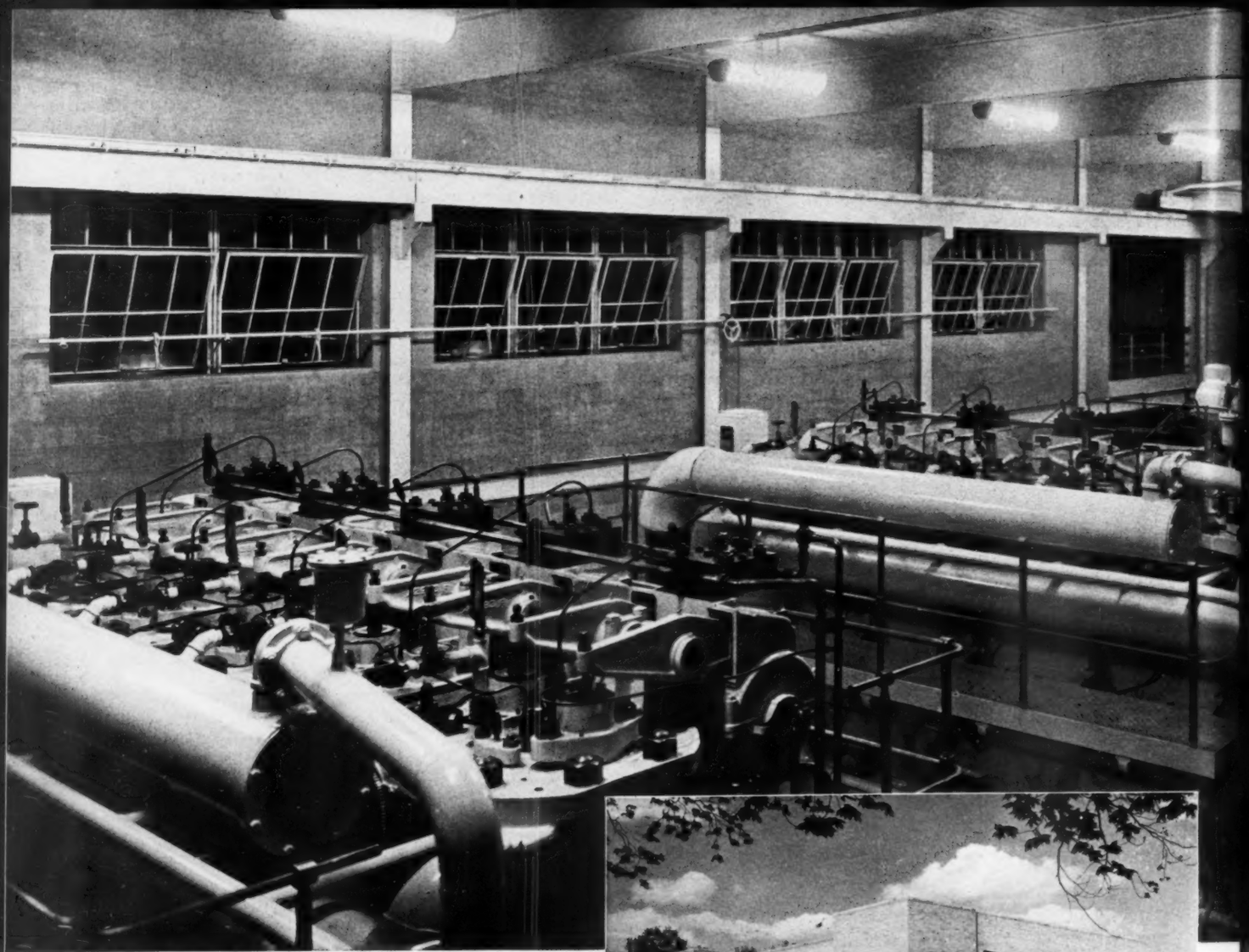
The *Foss No. 18* was rebuilt from the hull of the former tug *Alice,* and now carries a 450 hp. 8 cylinder 350 rpm. Enterprise Diesel, driving a Doran propeller through a Kingsbury thrust bearing and a Cummins auxiliary Diesel. The *Carl Foss,* formerly the tug *Sound,* a 57 footer, was rebuilt and given a new 200 hp. Enterprise Diesel. The *Edith Foss* now carries a new 500 hp. Atlas Diesel, while the new *Henry Foss,* ex *Cudahy* carries a 750 hp. Enterprise Diesel. The *Sandra Foss,* ex *Tyee,* was repowered with a 500 hp. Enterprise Diesel. These Foss units do not include the giant *Agnes Foss* reported in the July issue of DIESEL PROGRESS, a steel conversion job.

Yes, the 1942 season in Tacoma yards finds nearly eighty new Diesel engines installed, and another sixty will go into ships that won't get finished here during the current season—another record for the Pacific Coast passing before your eyes.

g Co. of Tacoma for Oceanic Fisheries.



"Victory" is a twin sister of "Oceanic"; same builder and owner, both with 250 hp. Atlas Diesels.

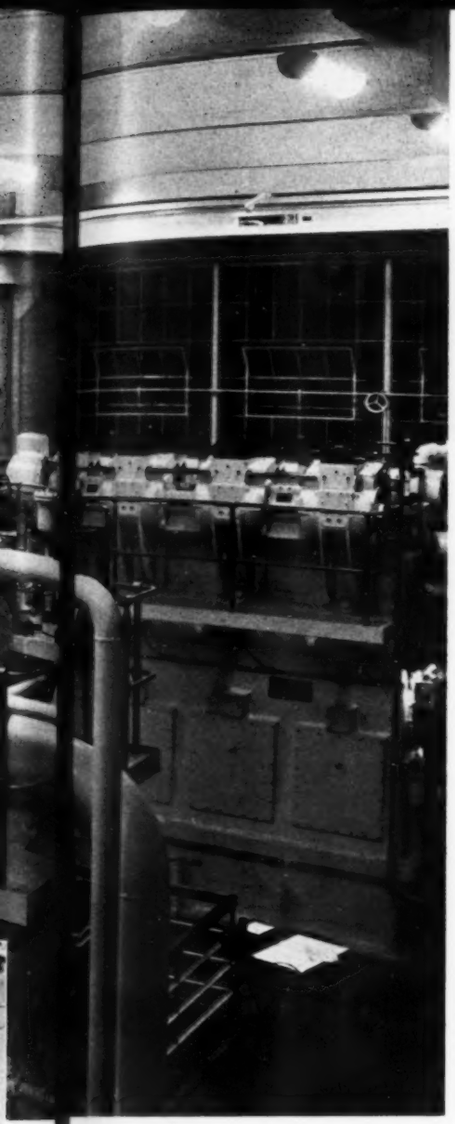


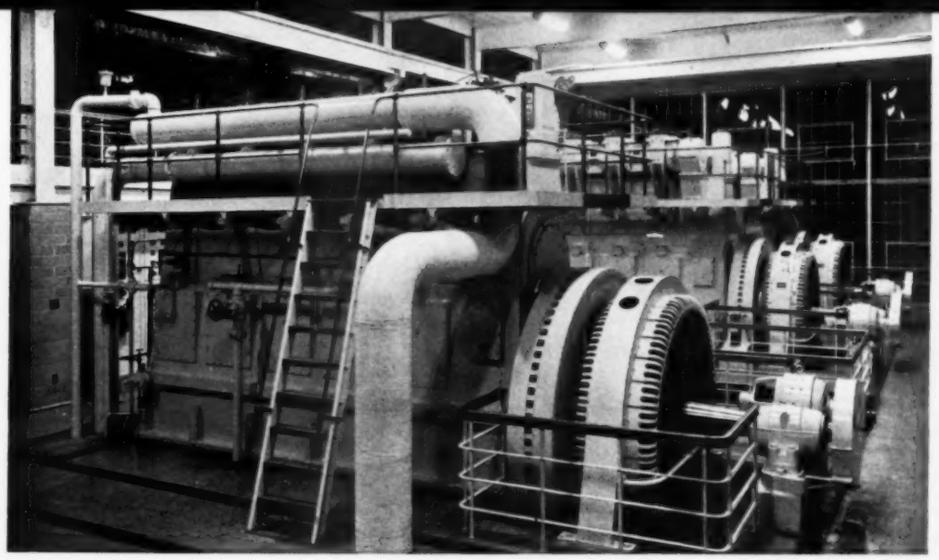
Top view of the three Fulton Diesels in the new Osage, Iowa, municipal plant. Manzel lubricators are seen, extreme right, on two engines and Woodward governors, top left.

SEVENTY-NINTH MUNICIPAL POWER PLANT *IN IOWA*

By GLEN V. YARGER*

Center: The very modern plant building at Osage. Note exhaust silencers are concealed, power lines and fuel storage tanks are underground. Above: Hilco reclaimer which handles all lube oil from the three Diesels.





These Fulton Diesels are rated 730 hp. each at 257 rpm; Elliott generators are 500 kw., and exciters are Morse Chain driven from generator shaft extensions.

OSAGE, Iowa, is a very old town made up of citizens with progressive views. When the thought of a municipal power plant was proposed, they did not jump at it blindly but considered it thoroughly and investigated other municipal plants, of which there were 78 in Iowa, before going ahead with full stride.

The City of Osage was served years ago by a privately owned plant, which later sold out to the Central States Power & Light Company, being served by that utility until the new municipal plant started operating last March.

The service from the utility was good but there were benefits the City desired which they realized could come only from a municipally owned plant. Too, Osage was paying the utility several thousand dollars each year for service which taxed the citizens to the limit. Mass meetings were held and considerable effort was put forth to acquaint the citizens of Osage with the advantages of a municipal plant. In 1940, the council and mayor put the question to vote asking for bonds of $325,000 to build a plant and distribution system. The vote carried by two to one.

*Superintendent, Osage, Iowa, Municipal plant.

The Hubbard Engineering Company of Chicago was engaged to prepare plans and specifications and have general supervision over the construction. Only two contracts were let for the construction job. The Stolz Construction Company received the contract for the building, while the Commonwealth Electric Company was awarded the contract for the equipment and wiring, as well as putting in a new white way on Main Street.

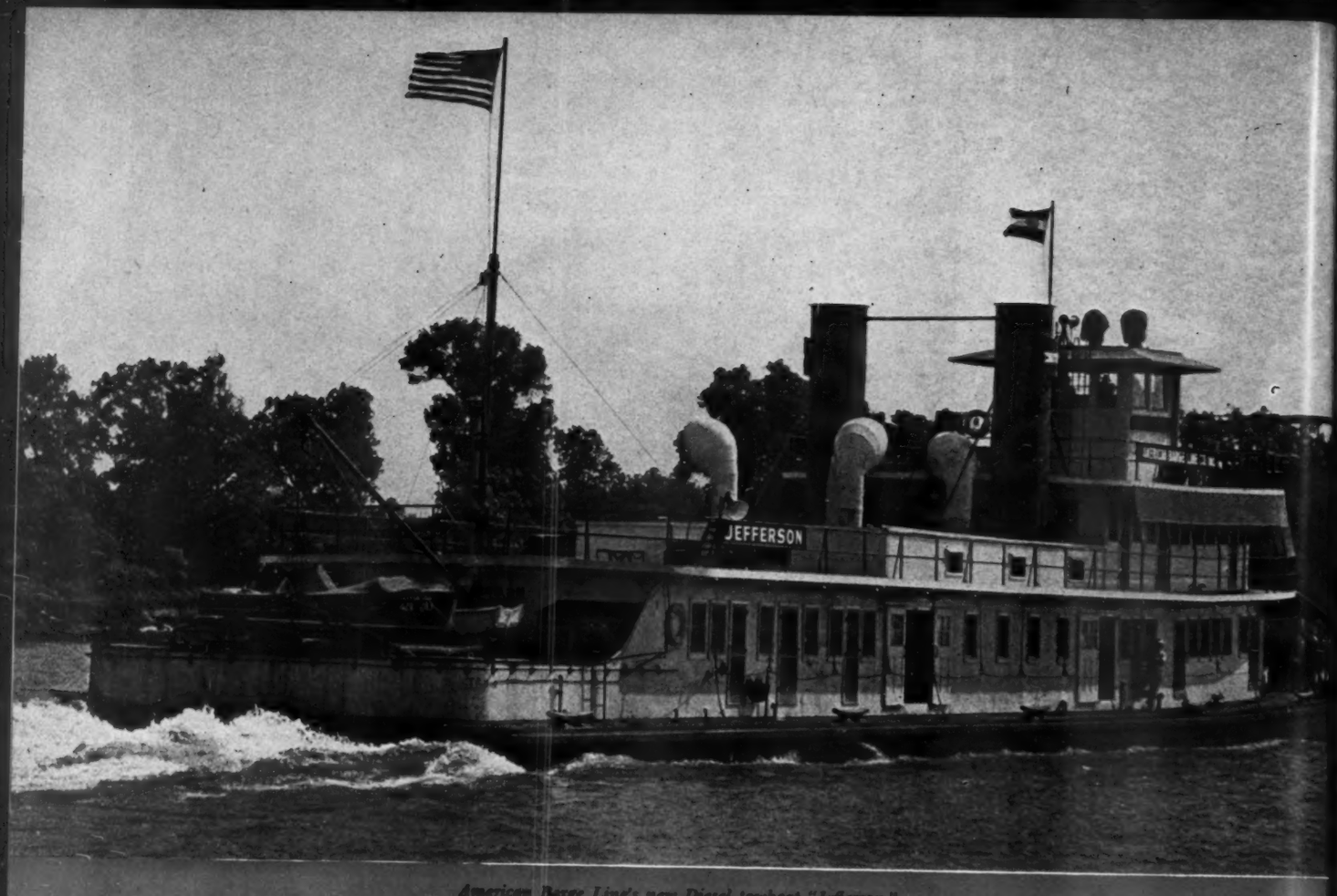
The council was deliberate in selecting the finest equipment. They purchased three Fulton Diesel engines of 730 hp. each at 257 rpm. and 500 kw. Elliott generators giving a total capacity of 1,500 kw. to the plant. The Fulton engines have their own make of solid injection fuel system which along with other special Fulton features result in better than the company's guarantees on fuel economy. The cylinder lubricators are Manzel while the engines are controlled by Woodward governors. The Fulton Diesels are also fitted with Cuno fuel filters, Ross lube oil coolers, Erie crankshafts, Penn Electric lube pressure and water temperature alarm control switches. Exciters are driven off the generator shaft extensions through Morse chain drives.

The switchboard was built by Commonwealth Electric Company using General Electric equipment throughout except for voltage regulation, for which Westinghouse Silverstat regulators were chosen, one for each unit.

Convenience of operation was considered throughout the plant as indicated by placing De Laval circulating water pumps and Viking fuel oil pumps with Pittsburgh positive displacement meters on the operating floor so they could be given the necessary attention. Conditioning of the lubricating oil was carefully considered and a Hilco oil reclaimer was selected. Conoco Dectol lubricating oil is used in all engines. Intake air is cleaned free from dirt by Air-Maze air filters.

Exhaust noises are made negligible by the use of Maxim silencers located in a small room so that air may be circulated around them and used for heating the office rooms in the winter. The engineers designed the plant for and recommended the use of Marlo evaporative coolers located on a balcony above the east side of the operating floor, so one cooler may be operated dry in the winter and the engine room air circulated through it for heating.

In designing the plant, the council insisted on eye appeal as well as its ability for service. There is nothing visible from the outside to give it the appearance of a power plant. The exhaust stacks are enclosed, two twenty thousand gallon fuel oil tanks are underground and all feeder lines are run underground. The City of Osage is justly proud of its new power plant. The first two months of operation indicate that the plant will meet all expectations.



American Barge Line's new Diesel towboat "Jefferson."

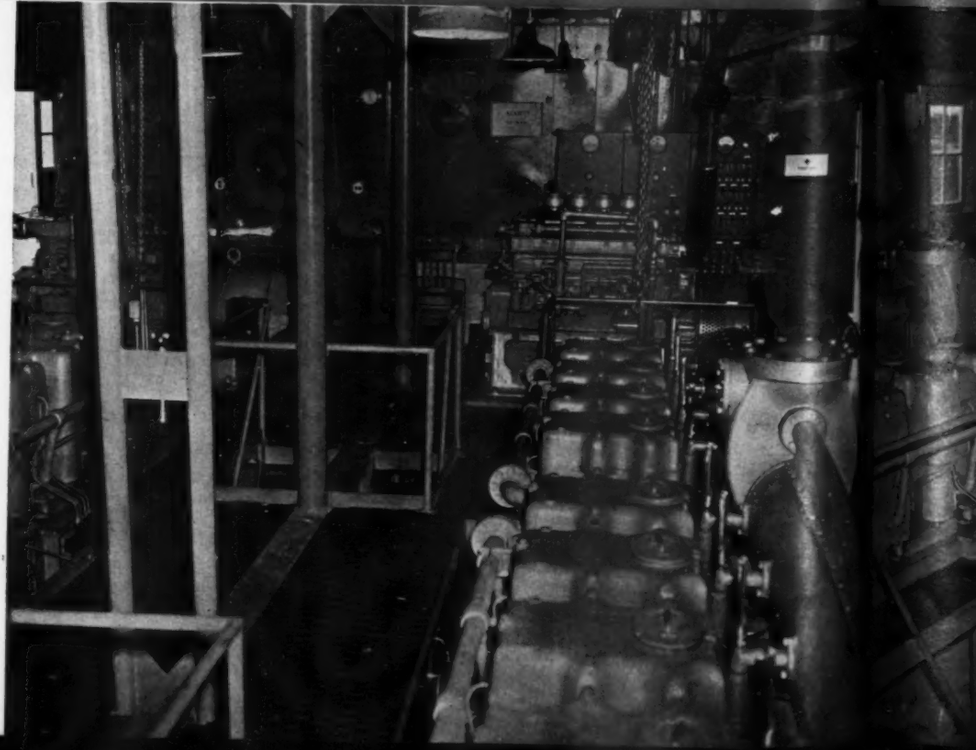
A GREAT DIESEL TOWBOA

By WILLIAM H. FULLERTON

View looking aft in the upper engine room. Auxiliary units are two Superior Diesels with 60 kw. and 40 kw. Westinghouse generators.

"JEFFERSON," owned and operated by the American Barge Line Company, is the seventh Diesel vessel acquired by this company, and entered its service late in May this year. She was designed and built by the Jeffersonville Boat & Machine Company, and approved by the American Bureau of Shipping.

The molded dimensions of the hull are 170 ft. long by 35 ft. wide by 9 ft. deep with 16 in. shear at the bow and no shear aft. The hull is transversely framed with three complete fore and aft bulkheads and two fore and aft trusses. The bow is scow type with a false model shaped fin which will roll logs away from the propellers and aid in cutting ice. There are no tunnels in the stern. The four towing knees on the bow are faced with 8 in. x 10 in. oak with steel rubbing strips. A 6 in. x 8 in. oak nosing goes



completely around the hull and is also faced with a steel rubbing strip. Adequate kevels, roller chocks, D irons and a timber head are provided on deck. A 500 lb. cast steel anchor is also provided and a one-ton swinging boom crane is mounted on the stern. Two telescoping masts are mounted, one forward and one aft, which will lower the masts beneath the search lights for passing under low obstacles. A 16-ft., 60 hp. Chris Craft motor boat is mounted on the stern.

The vessel is powered by two Cooper-Bessemer Diesel engines, bore 15½ in., stroke 22 in., each developing 1000 hp. at 300 rpm. Each engine is directly connected to an 8½ in. propeller shaft, which drives a four bladed, cast steel, Columbian propeller 74 in. in diameter with 58 in. pitch, turning inboard. The exhaust of the main engines is silenced by 12 in. Burgess snubbers located in the stacks. A Viking lube oil scavenging and a pressure pump is attached to each engine, each capable of delivering 120 gpm. at 300 rpm. The scavenging oil pump forces the lube oil through two four-cell Michiana filters and then through a heat exchanger into the storage tank. The pressure pump then forces it through a duplex Cuno filter and into the engine. Fuel oil is stored in four wing tanks and one athwartship tank amidship. Two fuel transfer pumps take the fuel oil from the tanks in the hull to the day tank in the top of the engine room, which day tank supplies fuel oil wherever necessary.

The vessel is steered by three rudders forward of the propellers and two rudders aft. The forward rudders are driven by a hydraulic ram 8 in. in diameter and the aft rudders by 6 in. ram, each individually controlled. Oil is supplied to these rams at 250 lbs. per square inch by a 10 hp. Roper centrifugal pump. Pressure is maintained constant by an automatic pressure switch. The pilot controls the rudders by the follow-up system in which the levers in the pilot house remain at the same angle as the rudders.

All auxiliaries are electrically driven with power supplied by 40 kw. and 60 kw. Diesel generating sets, each unit consisting of a Superior Diesel engine and Westinghouse D.C. generator.

Compressed air is supplied by a 20 hp. Worthington compressor and a 5 hp. Fairbanks-Morse compressor, which supply four air tanks carried forward in the mates' stores, having a total capacity of 340 cu. ft. of air at 300 lbs. per sq. in. The bilges are pumped and the fire line supplied by a 10 hp. centrifugal Aurora pump. Two Dean Hill centrifugal pumps are belt driven off the propeller shafts each with a capacity of 600 gpm. at 60 ft. head. These force river water through a Sims counter flow heat exchanger where the hot circulating water from the engines is cooled. Two Dean Hill centrifugal pumps, each with a capacity of 300 gpm. at 60 ft. head, force the cool circulating water through the lube oil coolers, the main engine blocks, the Diesel generator engine blocks, and the ice machine. This jacket water is carried in two wing tanks just aft the engine room.

A 3 hp. Frick ammonia refrigeration machine takes care of an ice maker and two walk-in refrigerators. Each refrigerator is 4 ft. wide, 8 ft. deep, and 8 ft. high. One is kept below freezing for meats and the other chilled for vegetables. The ice maker can freeze 150 lbs. of ice per 24 hours. A 9 cu. ft. Frigidaire is also in the galley to take care of small items.

The main deck house is 124 ft. long and the upper deck cabin is 44 ft. long. The cabins are completely steel framed with outside walls of steel. The interior is finished with fir plywood. The floor is green fire-proof plastic covered. All wiring is carried in extra heavy steel conduit with ample size wiring for the loads. Ceiling lights are controlled by wall switches, and duplex convenience outlets are provided in all rooms. The cabins are equipped with double deck spring beds and steel lockers.

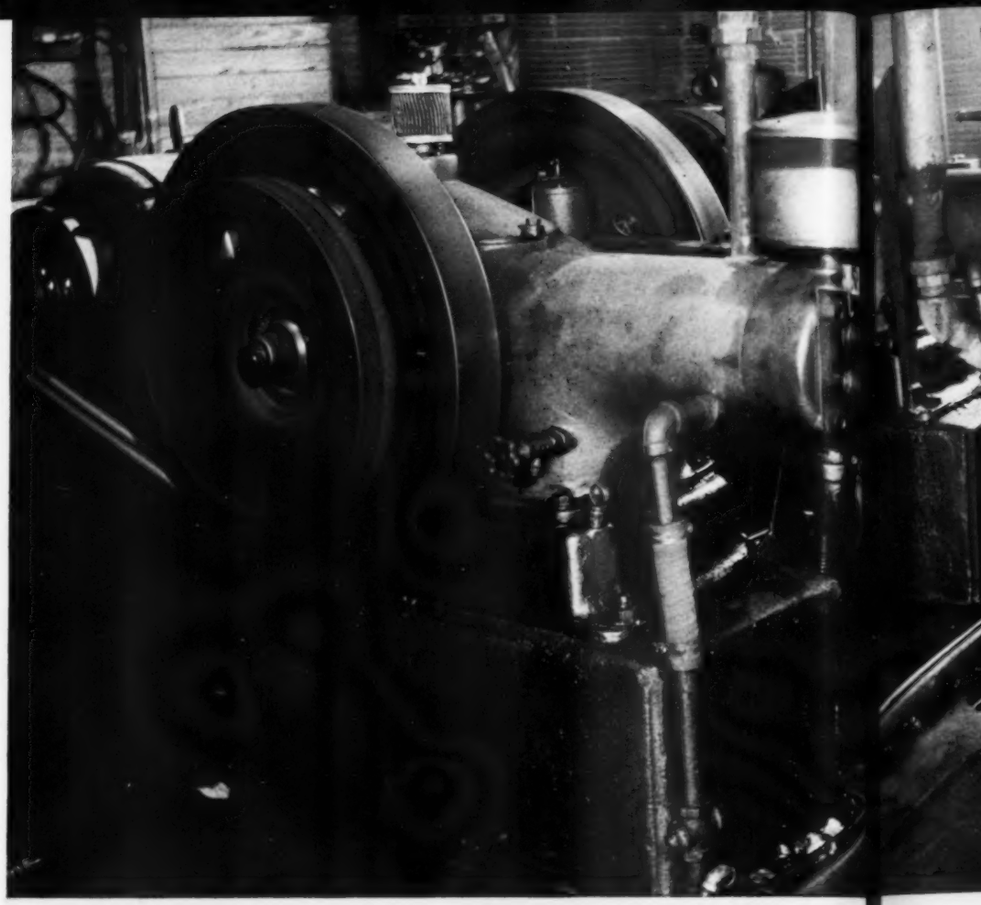
The galley, two dining rooms, maid's room, cook's room, and bath, pantry and refrigerators are all aft of the engine room on the main deck. The deck hands' room, strikers' room, mates' room, wash room, laundry, and linen lockers are forward of the engine room on the main deck. Officers' quarters are forward on the upper deck. These consist of captain's room and pilot's room with connecting bath, and two guest rooms with connecting bath, chief engineer's room and assistant engineer's room with connecting bath. There are accommodations for thirty people. Electric fans are provided in all rooms and the cabins are completely insulated with rock wool and metallation. An electric washing machine and stationary tubs are provided in the laundry.

The pilot house is 12 ft. x 16 ft. with inside stairway to officers' quarters. Double levers are supplied for each set of rudders. A ship-to-shore radio-telephone service set is provided in the pilot house.

The towing power of the *Jefferson* is estimated to be 10,000 tons at six miles per hour in pool or still water.

A NTERS RIVER SERVICE

The two main engines are Cooper-Bessemer Diesel rated 1000 hp. each at 300 rpm.



Two Witte Diesel generating units in the Jack Lay Service Station at Kingdom City, Missouri.

THE SERVICE STATION THA IESE

By BENNETT B. SMITH

IF you should look on a highway map of Missouri, you would see that Kingdom City is located on U. S. Highway 40, one of the first cross-country thoroughfares. Kingdom City is composed of several filling stations and eating establishments and is one of the main stopping places between Kansas City and St. Louis. The principal place and the main stopping point, however, is the Jack Lay service station, cafe, and garage, an enterprise which Diesels have helped to build.

While the highway was under construction, Mr. Lay, being far-visioned, purchased an acre of ground on the new thoroughfare paying $150 down on the transaction and building a small filling station. Some three weeks after this, he borrowed $1,500 and built a small garage where he sold tires and accessories, sandwiches and ice cream in the front part and did a general repair business in the back. He also built a four-room house for living quarters. The business opened October 15, 1927, with only one competitor.

Four years after the opening of the station and garage, Mr. Lay built ten single cabins followed by six double ones in 1938. Now there are twenty cottages in all, several of two-room capacity with individual showers and toilets, all heated from a central steam plant.

In 1937, the old filling station was torn down and the present 28 ft. x 90 ft. building was erected. This building contains an up-to-date restaurant with all modern equipment. The whole layout now covers three and a half acres which has been landscaped with trees, flowers, and shrubs. In 1940, this business was given the National award from the Garden Club for beauty, sanitation, cleanliness, and amount of progress made.

Ten years the business increased until a large volume of cafe as well as garage business was being done. Electricity was being secured from the Missouri Power and Light Co. Not so far away was a large quarry which was also being furnished power. It became a practice with the power company to shut off the current at noon each day so that repairs could be made at the quarry while the employees were off duty for the noonday meal. This was one of the very busy times at the Lay station. When the power was off, fans ceased to run, there was no power for the mixers, the compressors stopped, no lights were available. Mr. Lay tried to work out some plan with the corporation to shut down at some other time that would be less inconvenient to him, even an hour before or an hour after noon. But the company was adamant and continued to shut down at noon for the repairs. Then another interference occurred. In January, 1937, a heavy sleet storm came and the power line was out of use for nine consecutive days and nights.

This sort of service, along with possibly other little inconveniences which Mr. Lay had experienced, was not satisfactory. He had continued the use of the high line service for ten years and had reached the place where he was paying something like $175 per month for current. Looking for some way out, he settled on putting in his own plant which could be used in an emergency, but not to cut out high line service completely. In November, 1937, he pur-

The service station which has grown like Topsy from profits made by Diesels.

chased a 12 hp., 750 rpm. Witte Diesel. It was necessary, too, to build his own lines and revamp his distributing system. This unit was so satisfactory that, in April, 1938, he purchased the second Witte Diesel and began to use them regularly for light and power in the tourists' cabins and in the barbecue he had built. The power company was still supplying current for the cafe and garage.

Then came the spring of 1939 and time for the signing of a new contract with the power company. With the two Witte Diesels and a reduction of 4,000 kwh. through illumination of the dance hall, the new contract called for only enough power to run electric clocks, radio, and compressor, all of which would amount to $40 to $80 per month. Mr. Lay was to make his own current for the rest of his property. This arrangement was not satisfactory to the corporation and they notified the owner that his service would be discontinued in 30 days.

Jack Lay would not be outdone. Within a week, the third Witte Diesel was installed and the supplying of all electricity was taken over. Mr. Lay is well pleased with the operation of his Witte engines. They have run over a period of years with greatest efficiency and satisfaction, giving no trouble. After two years of hard running, day and night, the first engine was sent into the factory and given an overhauling followed the next year by the second unit. This put them both in first class condition again and they have continued running since then.

The load increased, more lights were added, other electric signs were installed, and more power was needed. The three Wittes were doing a fine job but the load was too heavy.

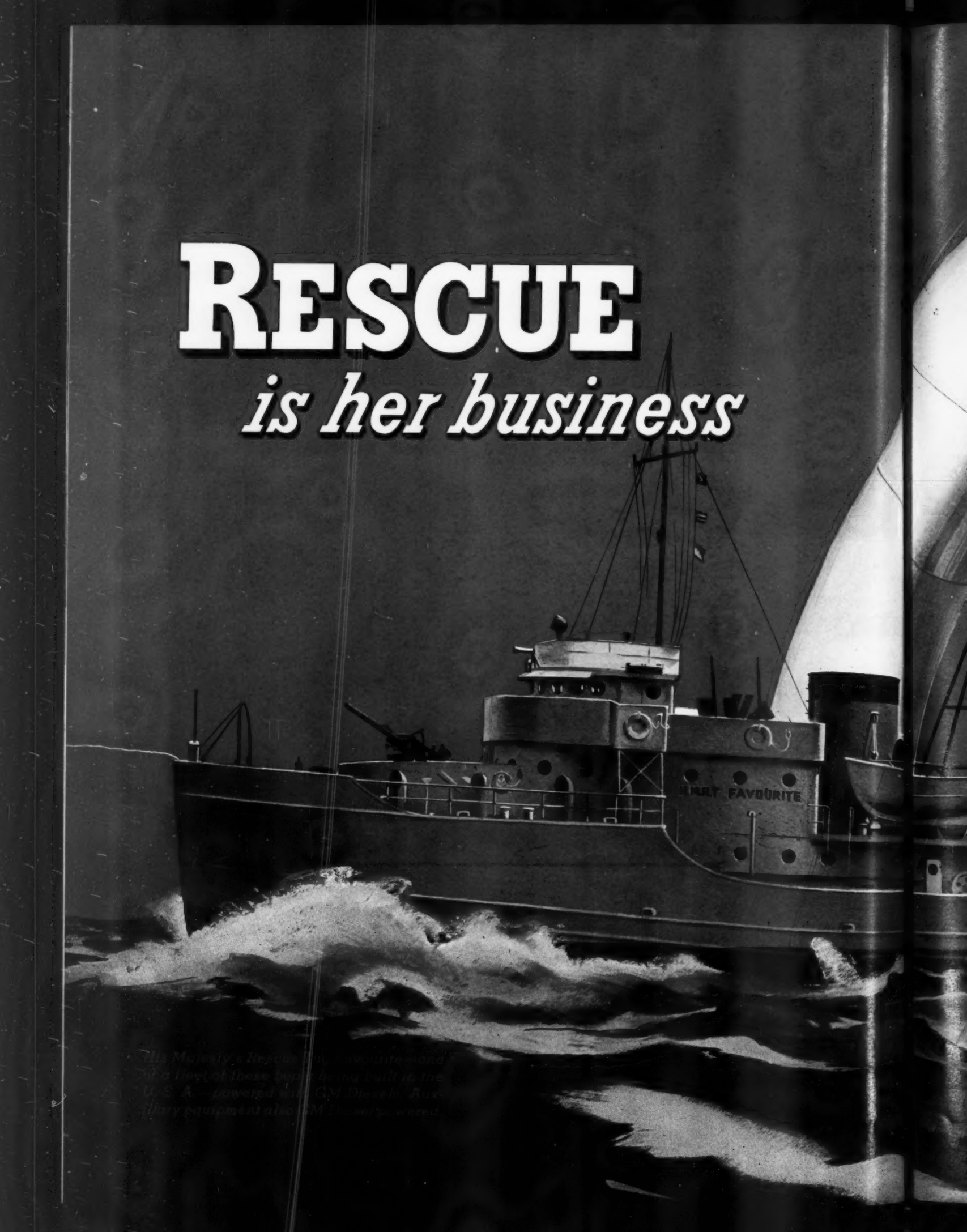
In July, 1940, a 25 kwh. Ready Power 900 rpm., 31½ kva. unit with an International Diesel was installed. This unit was rated at 50 hp. and gave plenty of electricity for the night peak loads. The third Witte was held as a standby. American Bosch timers and Purolator oil filters are used on all the engines.

The load has constantly increased until now 10,000 to 12,000 kwh. are being generated during the summer months and 9,000 to 10,000 per month during the winter. Being a private plant and the owner not being responsible to anyone other than himself, no accurate records of cost have been kept. A good estimate of the amount of generation to the gallon of fuel, however, is 10 to 12 kwh. The station and all the buildings are abundantly lighted. In addition to a bright interior of the cafe, many lights in the cottages, garage, and pumps are used.

Thus, Jack Lay has built a small city around himself in which he is independent from outside sources for power, water, and sewer. From the purchase of that one acre of land in 1926, with borrowed money, to the present investment of many thousands of dollars which includes two farms with a total of 240 acres; from two employees then to twenty now makes an interesting success story.

HA[illegible]IESELS BUILT

The third generating unit installed in the Jack Lay Service Station, a Ready Power unit with a 50 hp. International Diesel.


RESCUE
is her business
FAVOURITE

LIKE hundreds of U. S. Navy vessels built for rescue and salvage service, H. M. R. T. FAVOURITE and a fleet of her sisters being built in U. S. yards are powered with dependable GM Diesels.

CLEVELAND DIESEL ENGINE DIVISION
General Motors Corporation

Another of the rescue tug fleet is launched—H.M.R.T. Bold—also powered by GM Diesels. More than 2,000,000 tons of United Nations shipping have been saved by boats in this service.

GENERAL MOTORS
DIESEL

ST. ANDREWS BAY DIESEL TUGS AND FISHERS

By WILL H. FULLERTON

ST. ANDREWS Bay and the adjacent waters about Panama City, Florida, comprise altogether as beautiful a waterfront as is to be seen anywhere on the continent; there is, also, much more than beauty involved.

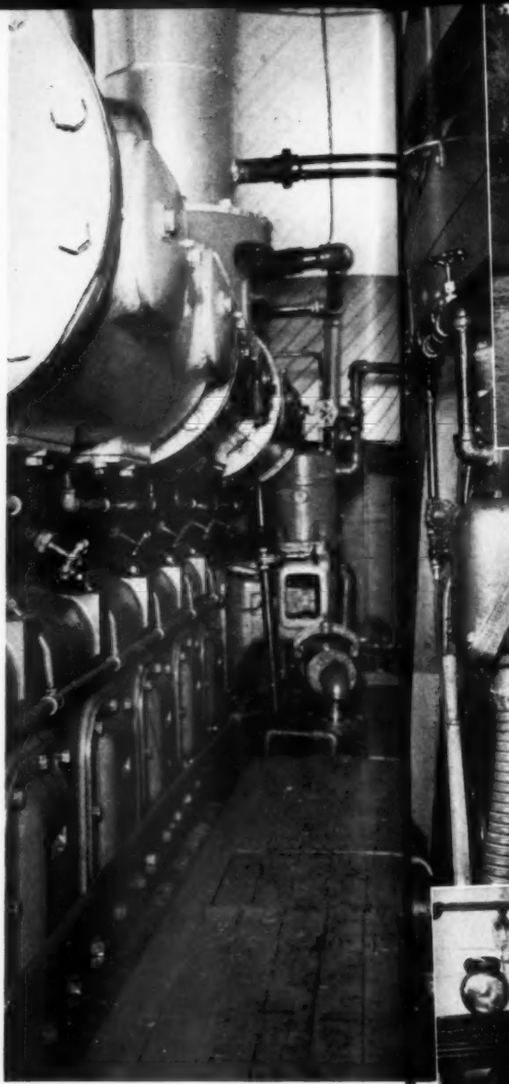
Panama City is a busy little city. Fishing, both commercial and charter boat sport variety, is an active interest. Tourist traffic is no small matter. A new shipyard is to turn out a few dozen Liberty ships. Over at Millville, an industrial suburb, there is a huge paper mill. Paper mills mean pulpwood in a never-ending stream and pulpwood requires barges and tugboats which, in turn, call for marine Diesel engines. Contract towing of pulpwood is a major interest with numerous tugboat operators in the Gulf States; the business is steady and the demand for wood constant, year in and year out, and many tugs have been built to serve this industry. In Panama City, the St. Andrews Bay Towing and Lighterage Company has been identified with pulpwood traffic for many years and has developed an efficient fleet of powerful towboats handled by able men. The latest addition to the St. Andrews fleet is the big tug *Sherman VI*. She is 73 ft. overall length with a beam of 18 ft. 6 in. and draws 9 ft. 4 in. when loaded. Built at the firm's own yards at Millville by A. B. Ceruti, Panama City boat builder, *Sherman VI* is of husky construction. "She's all wood," says Mr. Ceruti, "and plenty of it!" Framing is of sawn cypress, doubled, each frame finishing about 6 in. by 8 in. and set on close spacing. Three sets of 2 in. by 10 in. clamps bolted inside the frames, stiffen the hull tremendously; planking is 2½ in. cypress. Mr. Ceruti says he never built a stronger hull and he has built many. Wood is the thing for tugboat construction today, says this veteran builder, if you can get the wood; a steel vessel of comparable strength and size at today's labor costs would far exceed the building cost of the *Sherman VI* and very likely would have no longer life; from twenty to fifty years or more of service is not unusual for a well-built cypress hull.

The power plant of *Sherman VI* matches the hull in simplicity and strength. "And, as for power," says Skipper H. M. Chestnut, "it maybe more than matches it. We've got power enough for a boat twenty feet longer, but Mr. Sherman believes in packing power into a tugboat; every boat in the fleet has plenty of it. The engine rooms are a little crowded but when we're handling a log tow in rough water that big Diesel is mighty comforting."

A Fairbanks-Morse Diesel of six cylinders is the propulsion engine installed. Power developed is 450 hp. at 300 rpm. The propeller installed is a three-blade Ovoid type Columbian, made to the design of Fairbanks-Morse engineers, and is 72 in. diameter and 42 in. pitch. With the tug tied to the dock, the engine turned this wheel at 280 rpm. which shows the engine conservatively rated for heavy towing. "Operating temperatures are low," says Capt. Chestnut. "Even when the engine is turned as high as 380 rpm.," says the skipper, "the temperatures are still not excessive: ample testimony not only of good design but also of perfect alignment in installation."

Of two-cycle, pump scavenger type, this Diesel is cooled by closed circuit using a Ross heat exchanger. Another Ross exchanger cools the lube oil. Fully protected by a built-in automatic alarm on cooling water and lube oil lines, the engine is also equipped with an Alnor pyrometer for ascertaining the working temperature of all cylinders. Penflex tubing of 14 in. diameter carries the exhaust to the Burgess snubber. A Briggs clarifier is used for the lubrication system.

The auxiilary unit is also Fairbanks-Morse. Built around a one-cylinder, 10 hp. Model 36 Diesel, the unit comprises a Fairbanks-Morse 5 kw. generator, a rotary fire and bilge pump and a 2-stage 3¾ in. by 3¾ in. Fairbanks-Morse compressor. A 3 hp. electric motor drives a 3 in. centrifugal Fairbanks-Morse bilge pump which unit is served electrically from auxiliary generator. A feature of the layout particularly appealing to the tug's engineer is that either of the pumps, or the auxiliary compressor or generator, can be operated separately as may be needed.

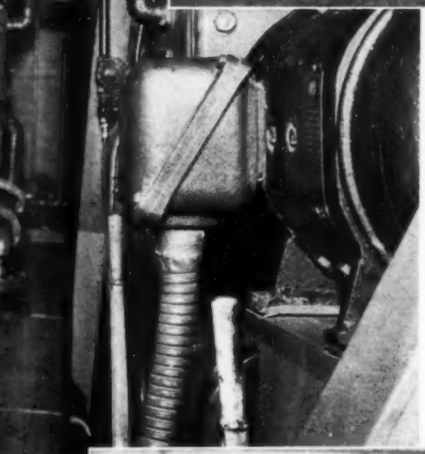


Starboard side of the Fairbanks-Morse, 6-cylinder, 450 hp., 300 rpm. propulsion Diesel on the tug "Sherman VI".

Another 5 kw. Fairbanks-Morse generator is V-belt driven from the after end of the main engine. A Listenwalter switchboard distributes the current to the various circuits. Auxiliary pumps and motors are all of Fairbanks-Morse make; a 1 hp. motor drives the fuel transfer pump; a 2 hp. motor powers the lube oil pump and the water pump for supplying cooling water for lube oil. Batteries are the Exide Ironclad Marine type. Current is also supplied for lighting, including searchlights and floodlights, and for the Jefferson-Travis Type 1000-C 100 watt radiophone.

Vibration when under way, according to the skipper, is not enough to notice; the 6 in. hammered steel propeller shaft turns in a Goodrich Cutless bearing. Fuel consumption under generally heavy towing conditions averages 15 gallons an hour. Texaco supplies both fuel oil and lube, the latter being 303.20 Texaco Marine.

"Audrey C III", an old government hull, now carrying her third main engine, a F-M 320 hp. Diesel.



"What do you like best about the whole thing?" Capt. Chestnut was asked. "Hard to say," says he, thoughtfully. "It's a swell tug, all around; seems equal to any load, all day long, never overheating; maybe the oil-cooled pistons have something to do with it. It sure fills up the engine room but it does the work!"

Contract towing of petroleum products and of pulpwood is the general work of *Sherman VI*, though occasion may call for something special like the recent salvaging of a loaded and wrecked barge for a New Orleans marine surveyor. Whatever the job is, this heavy wooden tug with her big Diesel can handle it, says Capt. Chestnut and he ought to know—he has been tugboating for twenty years in the Gulf, Atlantic and tributary waters and knows his tugs.

Other equipment aboard includes the Garland galley range, using Butane gas for fuel; Pyrene fire extinguishers; Kahlenberg Triplex airhorn; Perko sidelights; 1-mile ray "Portable" searchlight; Grouse-Hinds floodlight for after deck; Ritchie compass; A-E-Co windlass; Down-East dory for life-boat. Fuel tanks are of 6,000 gallon capacity; fresh water, 500 gallons. Sleeping quarters are provided for two in the forward cabin, four in the after cabin and two in the cabin adjoining the pilot house; every bunk is fitted with an innerspring mattress.

Altogether, the St. Andrews Bay Towing and Lighterage Company of Panama City, has a flagship able to take its place in any fleet. W. C. Sherman, President, is decidedly one more gentleman who knows his tugboats!

Fairbanks-Morse Diesels also power other boats of this Florida fleet. One of these, the towboat *Audrey C. III*, has had a varied career. Like

Main engine on the "Audrey C III" is this Fairbanks-Morse, 8-cylinder, 320 hp., 400 rpm. Diesel. Note Alnor pyrometer, right foreground.

Another all-wood St. Andrews tug, the "Capt. Alex", recently repowered with a F-M 200 hp. Diesel.

the new *Sherman VI*, the *Audrey C. III* is of wood construction and was originally built for government service in about 1922. The hull is long, measuring 72 ft. overall, with low freeboard; beam is only 15 ft.; the draft, about 8 ft. loaded.

Her first main engine was a heavy duty gasoline motor developing 70 hp., and according to all reports this engine stood up well enough for the service for which the craft was intended. When the St. Andrews Bay Towing and Lighterage Company acquired the boat later on in its career, however, the power did not measure up to the St. Andrews' standards for towboat use and a 210 hp. Fairbanks-Morse Diesel was installed.

As local tugboat skippers say, Mr. Sherman likes to put plenty of power aboard and so *Audrey C. III* got another boost a year ago. The new engine was a F-M Diesel of eight cylinders, of 320 hp. at 400 rpm. A 58 in. by 32 in. 3-blade Ovoid propeller of Fairbanks-Morse design and Columbian make is used; engine equipment features an Alnor Pyrometer and Madison-Kipp lubricator. A 3½ kw. Fairbanks-Morse generator is driven off the forward end of the engine. No auxiliary Diesel plant is installed as compressed air and a small F-M gasoline-driven compressor answers the purpose.

Towing performance of this old re-powered hull is surprising; she tows up to six barges, with total loads adding up to 3,000 tons. Operating costs are low; all-around performance is very satisfactory, says J. H. Sherman of the towing firm.

Capt. Alex is another Sherman boat, built at the company's plant by A. B. Ceruti. Though the tug is only 52 ft. by 13 ft. by 6½ ft., she has the strength and ability of a much larger craft. Her keel is one length of long leaf yellow pine, finishing 6 in. by 12 in.; cypress cut frames were used, of 2½ in. rough, air-dried lumber, doubled, finishing 5 in. by 5 in.; all fastenings are galvanized.

Launched five years ago, the first power plant was of only 70 hp. and was soon replaced by a Fairbanks-Morse Diesel. More power yet was needed, so a 5-cylinder F-M Diesel, rated at 200 hp. at 400 rpm., was installed, to turn a 52 in. by 31 in. Columbian Style MI propeller. Alnor pyrometer, Madison-Kipp lubricator, and Fairbanks-Morse automatic water and lube oil alarm are essential features; 1½ kw. F-M generator is driven off the forward end and like the *Audrey C. III, Capt. Alex* depends on a F-M gasoline-driven compressor for starting air.

Part of St. Andrews Bay Towing & Lighterage Co.'s fleet of tugs and fishers. "Martha Lillian", a 50 ft. snapper schooner carries a F-M 40 hp. auxiliary Diesel.

Newest of the St. Andrews tugs is the "Sherman VI", a 73 ft. all wood hull pictured off New Orleans just after dropping a tow from Florida.

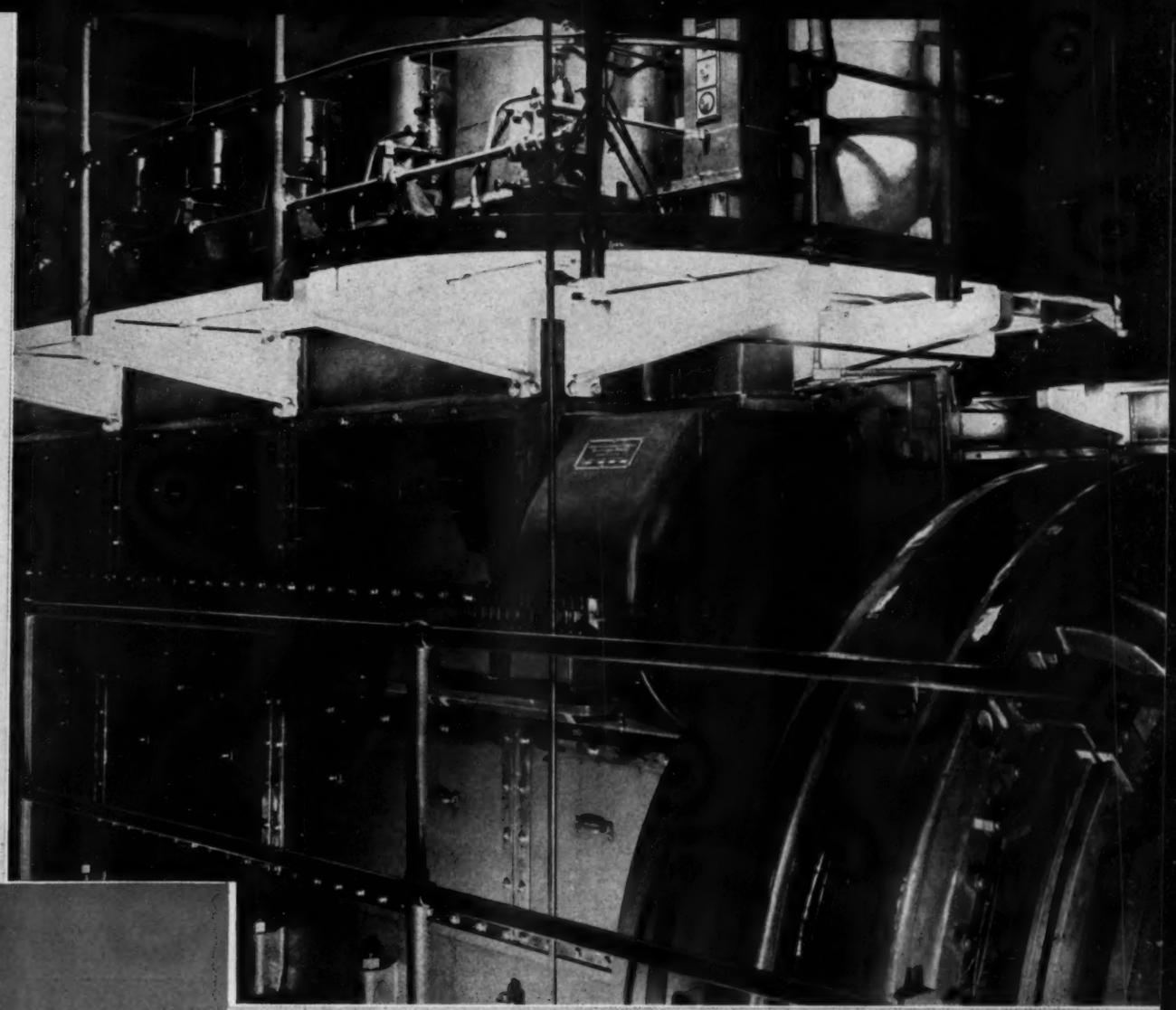
Although her scant dimensions hinder her from open-water towing jobs, *Capt. Alex* is a real performer in protected waters. For towing performance, this tug makes a four-mile an hour rate handling four barges, loaded with 400 pulpwood units, or about 500 cords.

"Very satisfactory," says Mr. Sherman. Lube and fuel costs are low. Since the installation two years ago, this Diesel has never been dismantled for a general overhaul, only minor repairs ever having been necessary. "After putting in this engine," Mr. Sherman remarks, "we put this boat to work. For over two weeks we hardly cooled her down, but the steady grind didn't do her harm."

Besides the towboat fleet, the St. Andrews Bay Towing and Lighterage Company owns three off-shore snapper schooners, the 62-footers *Hazel* and *Anna Belle*, and the 50 ft. *Martha Lillian*. These vessels fish the Mexican snapper banks off Yucatan, delivering the catches to the Saunders Fish Company at Pensacola. The two larger boats are powered with Fairbanks-Morse Diesels of 4 cylinders, 4-cycle type, of 40 ft. Joe's reduction gears of 2:1 ratio are used; starting is electrical, the engines being fitted with Leece-Neville starters and generators using Exide batteries.

The smaller *Martha Lillian* is driven by a 3-cylinder Fairbanks-Morse Diesel of 30 hp. at 1200; the Joe's 2:1 gear is also featured on this model. Starting is by hand; current for the ship's lights is furnished by a gasoline-driven Fairbanks-Morse auxiliary generating plant.

Throughout the fleet, all installation engineering has been under supervision of Fairbanks-Morse field men. "And they've done fine jobs," says J. H. Sherman.



In this close-up view of the McIntosh & Seymour Diesel and Elliott generator are seen Manzel lubricator, Woodward governor, and American Bosch fuel injection pumps.

13.4 K. W. H. PER GALLON A FOUR-YEAR RECORD AT ALTMAN'S

WM. H. GOTTLIEB

FOR more than four years, B. Altman & Co., one of New York City's great Fifth Avenue department stores, has operated a combined steam and Diesel generating plant with notable success. With performances as the criterion, the Diesels have earned a place as the basic power units in the plant. There is a Diesel running at Altman's virtually all the time and the two units have amassed a record of more than 45,000 engine hours of service without a single enforced shutdown.

Prior to the fall of 1937, the company had seven steam engines which supplied both power and heat. Even in winter, however, there was a considerable excess of steam for heating purposes and it was determined that Diesels would provide a more economical power supply and improve the plant's heat balance. Accordingly, Altman's removed two of the steam units and installed two 860 hp. Alco Diesels of the four-cycle McIntosh & Seymour design. These engines each have six cylinders of 17½ in. bore and 25 in. stroke and develop rated horsepower at 257 rpm. Each is direct-connected to a 900 kw., 125-volt, direct-current Elliott generator. The plant now has a total installed horsepower of 5420, 3700 hp. in steam and 1720 hp. in Diesels. The Diesels have proven so economical that the saving under previous costs has been sufficient to pay the entire cost of the Diesel plant in just four years.

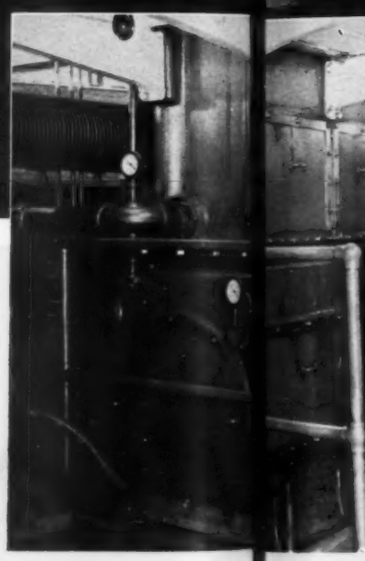
Records for the first four calendar years of operation tell this success story succinctly. On the following page are the important figures.

Year	Engine Hours	Net Kw. Hrs. Generated	Gal. Fuel Consumed	Gals. Lube Consumed
1938	7,767	2,973,460	230,840	1,567
1939	10,485	4,423,990	321,630	1,672
1940	11,035	4,708,940	351,013	1,710
1941	12,047	4,690,560	353,946	1,620
Total	41,334	16,796,950	1,257,429	6,569

These figures on Diesel production show the high fuel economy of 13.4 kw. hrs. per gallon of fuel consumed. Lubricating oil economy was equally impressive with 5,411 rated hp. hrs. for each gallon of lube consumed. In 1941, even this figure was exceeded by a record of 6,395 hp. hrs. per gallon. The figures reveal that with each succeeding year the Diesels won greater confidence on the part of the management and took over greater and greater parts of the load. In 1938 the engineers ran these engines a cautious 7,767 hours. By 1941 the figure of 12,047 engine hours shows graphically that Altman engineers were running their Diesels every possible hour. At night, when the demand is well below the capacity of one engine, it is a Diesel that carries the load. During the ten hours each day that the store is open, both engines are in service. The only time that a Diesel is shut down in favor of a steam engine is when severe cold creates a greater than normal demand for steam heat.

Operating efficiency is no accident at Altman's. J. A. Cummings, Altman's Chief Engineer, assured himself of a good load factor before installing the equipment. For the ten hour peak runs, the Diesels operate at nearly full load and even at night the unit in use is delivering better than 50 percent of capacity, making an average load factor of nearly 70 percent. Another reason for the excellent results obtained can be found in the choice and arrangement of equipment. Altman's refuses to be satisfied with second best. Heavy duty, slow speed engines were chosen to insure efficient service over a long span of years. Only pure air, fuel, water and lubricating oil are allowed to enter the Diesels.

Engine air is drawn through American impingement-type filters placed in a section of the boiler room which opens on the sidewalk through gratings so that an ample supply of air from the outdoors is assured. Fuel storage



View of the B. Altman & Co. store at Fifth Avenue and 34th Street, New York

capacity in the city is limited to 50,000 gallons and 10,000 of this is devoted to Diesel fuel.

Lubricating oil for each unit is purified continuously by Honan-Crane activated clay lube reclaimer which draws oil from the sump, removes impurities and returns it to the sump. Each unit is provided with a cooler to keep oil at the desired temperature.

Cylinders are supplied with oil by Manzel mechanical lubricators. Enough of the oil fed

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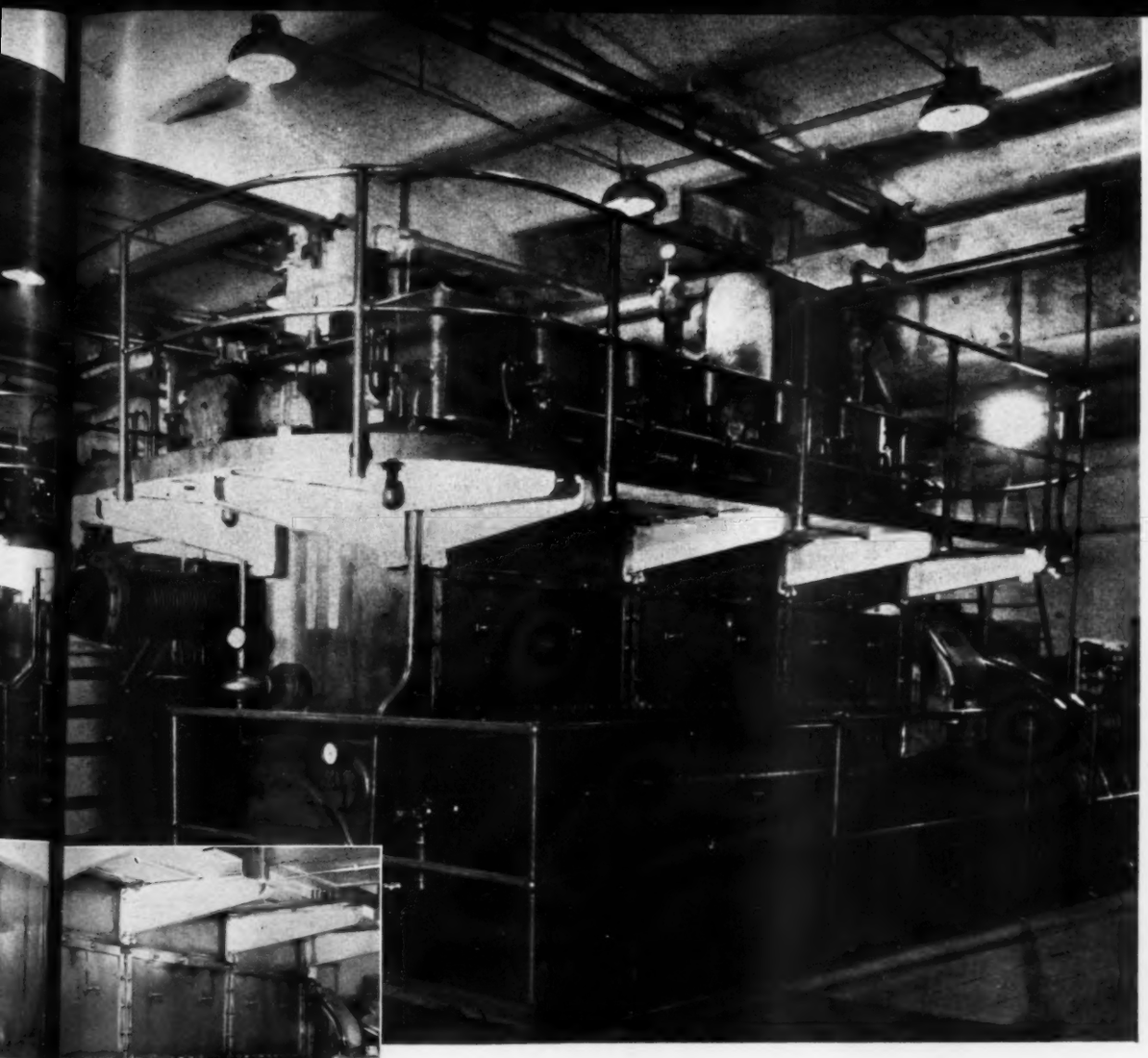


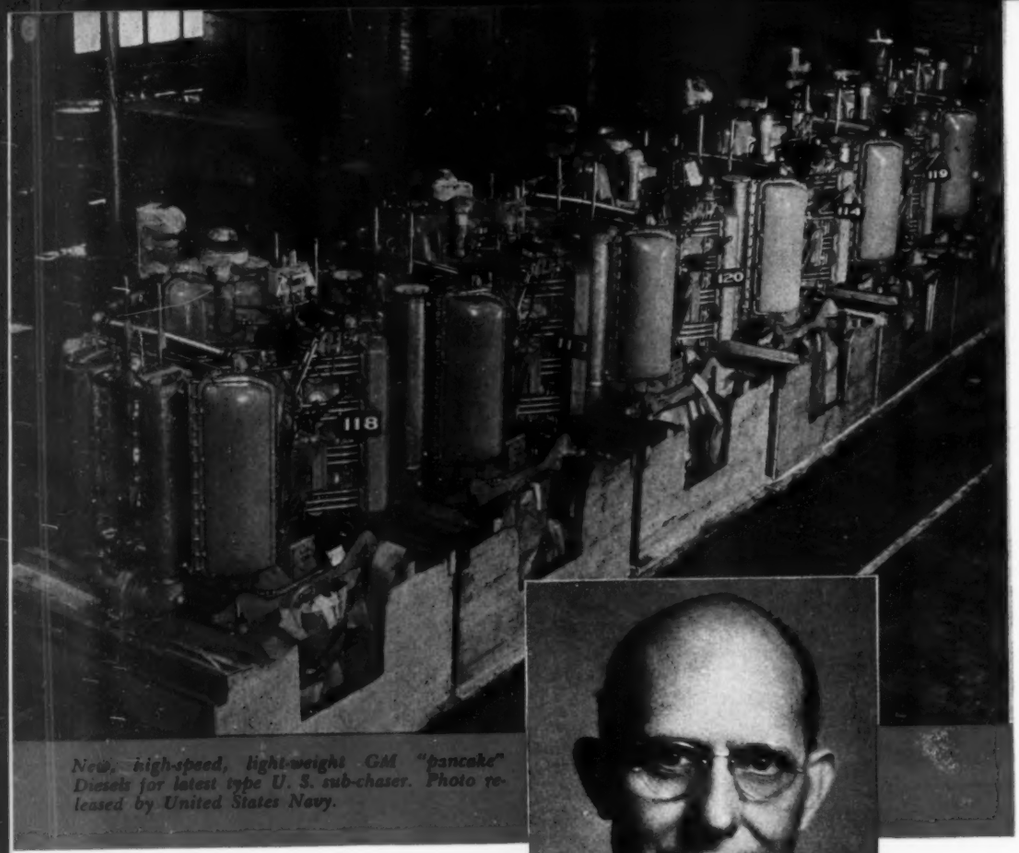
The two Alco Diesels of McIntosh & Seymour design, 860 hp. each are mounted on Korfund Vibro-Isolators. Note left end of each engine Honan-Crane lube oil purifiers, and in insert, Nugent fuel filters, and Weston thermometers.

to the cylinders drains into the crankcase so that it is never necessary to add oil to the crankcase supply. In fact, the operators have to take out about thirty gallons a month. No oil is discarded and periodic tests show that the lubricant now in the system remains in excellent condition. The purifier is of the cartridge type and each cartridge serves a full 900 hours of operation.

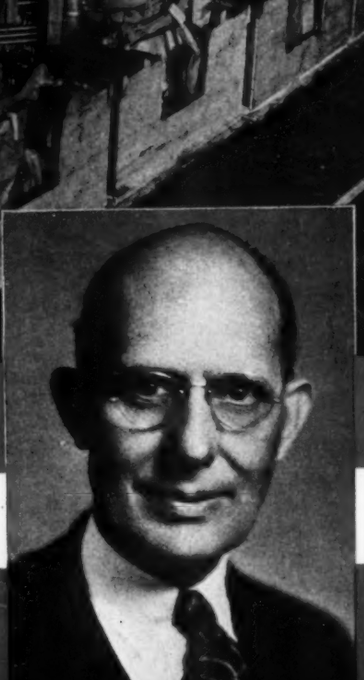
Altman's prefers an attentive operator to the best of alarm systems but the protection of alarms has not been ignored. An undue drop in lubricating oil pressure or rise in cooling water temperature would summon the operator at once. Each engine is provided with an alarm panel which includes an exhaust pyrometer. There is no chance that this plant will lack compressed air for starting the engines, for it contains three compressors, one driven by motor, one by gasoline engine, one by steam.

In a store of this type, power must be an unobtrusive servant. Altman's does not cater to a clientel that would overlook a noisy exhaust or condone a vibrating floor. This plant gives conclusive evidence that such evils are totally unnecessary. Both intake air and exhaust gas pass through silencers placed horizontally in a room 40 ft. below street level. From the exhaust silencers, gases vent through a tall stack. Engine noise is slight indeed and none seeps through to the sales floors above. Each engine is mounted on a set of Korfund Vibro-Isolators which absorb all vibration so effectively that none can be detected even a few inches from an operating engine. To complete the isolation, sections of flexible metal hose are set into the exhaust and air lines and other connections. These engines serve but are neither seen, felt nor heard.

A record of 45,000 hours of service without an enforced shutdown is a tribute to engine durability but also to the thorough-going, methodical system of maintenance instituted by by Mr. Cummings. Every 2,000 hours the operators clean nozzles and grind valves. At 5,000 hours they inspect the fuel pumps. At 8,000 hours they pull pistons for a complete checkup. Rings are usually found free and bearing and cylinder wear is small. This program of preventive maintenance undoubtedly deserves much of the credit for the fact that the plant has never required a major repair. With good equipment intelligently operated, Altman's expects to add many more years to its impressive four-year record without lessening of engine efficiency and economy.



New, high-speed, light-weight GM "pancake" Diesels for latest type U. S. sub-chaser. Photo released by United States Navy.



Charles F. Kettering, vice president of General Motors in charge of research.

NAVY HAILS NEW DIESEL ENGINE

GM Produces Light, Powerful Unit For Fast Sub-Chasers

PUBLICATION of the following has been authorized by the United States Navy: Electro-Motive Division of General Motors Corporation is in full production of a new high-speed, high-horsepower, light-weight Diesel engine and variable pitch marine propeller which add materially to the cruising radius, speed and maneuverability of United States sub-chasers.

The new Diesel has been dubbed "the pancake" because of its unusual construction. Four banks of four cylinders each are located around a vertical crankshaft. The engine, reduction gear, and propeller pitch control are designed as a complete unit using a bevel pinion and gear between the engine and propeller shaft. Because of the use of the reversible propeller, there is no necessity for reversing the engine, or providing reverse gears for the propeller shaft. Every effort has been made to reduce weight of the complete installation and the engine is believed to be the lightest ocean duty Diesel engine in the world. It occupies about one-third the space of the best previous Diesel engines of the same high horsepower.

The weight and space gained by the use of the new engine and propeller can be utilized for more fuel for greater range, or for additional armament and ammunition, lighter overall weight for more speed, or for the installation of more engines to give greater speed. In actual current practice, a combination of all these gains is designed into the newer sub-chasers.

Two of the new engines are being installed in the smaller type of subchaser currently being built and the ships which are being delivered by the Navy are satisfactorily meeting the design requirements.

Use of Diesel engines eliminates the fire hazard attendant upon attempts to get high horsepower with low weight by using gasoline engines. Diesel propelled boats are less vulnerable to air attack. The variable pitch propeller is an important factor in improving cruising range and provides exceptional maneuverability.

Development of the new engine grew out of the search by the Navy for such a power plant since the end of World War I. Approximately a year before Hitler marched on Poland, the problem was discussed with Charles F. Kettering, vice-president of General Motors in charge of research. Mr. Kettering directed the development of the engine in General Motors Research Laboratories at Detroit. Concurrently the laboratory was working on the reversible propeller as a separate project.

Several engines were built in the GM laboratory during the experimental period. The engine design was approved and Electro-Motive Division was designed as manufacturer in January, 1941. Within twelve months, an addition to the Electro-Motive Diesel locomotive plant was built and equipped, despite difficulties of securing machinery during 1941, and a number of production engines turned out. These were put through the usual period of development test operation and regular production was started, with the result that in May of this year the production rate was up to Navy requirements.

The Cedarburg, Wisconsin, Municipal Power Plant.

PROFITS AND PERFORMANCE AT CEDARBURG, WISCONSIN

By WM. H. GOTTLIEB

IN the final analysis, a municipal Diesel plant can make one great contribution to its community: unfailing service at low cost. At Cedarburg, Wisconsin, this performance has been repeated and expanded from year to year until now it becomes a record of impressive proportion. For sixteen years, this community of 2500 population has depended on Nordberg Diesels for light and power. In all these years, the engines have operated more than 140,000 hours and there has not been a single breakdown, not a single interruption of service due to failure of power plant equipment. That is only half the story. The other half concerns reduction in rates to the consumer from an initial schedule of 12 cents a kilowatt hour to the current schedule of 4 cents per kw.hr. for the first 40, 2.5 cents for the next 60, and 2 cents per kw.hr. for all over 100. We may estimate conservatively that these reductions have saved Cedarburg consumers more than half a million dollars, an outright gift of $500 to every customer.

Cedarburg built its first municipal power plant, with steam engines as prime movers in 1901, but it remained for the introduction of Diesels to bring the era of public utility prosperity. The first Diesel, installed in 1926, was a 450 hp., 3 cylinder, 225 rpm. Nordberg direct-connected to a 300 kw., 4000 volt, Allis-Chalmers generator. A 4 cylinder unit, rated at 750 hp. at 240 rpm., and a direct-driven 500 kw. generator were added in 1928. The plant reached its present stage of development in 1937 with the installation of a 4 cylinder, 1000 hp., 257 rpm. engine with direct-connected 700 kw. generator. All three engines are two-cycle, air-injection, cross-head type, Nordberg Diesels. The three Allis-Chalmers generators have direct-connected exciters.

This plant expansion was both cause and effect of a growth in plant production and community consumption of electric current. Diesel economy permitted repeated rate reductions which encouraged the use of electric appliances and power. The earliest figures available show that in the year 1911, the municipal power system produced 160,258 kw.hrs. for 206 consumers at a loss of about $1000. In 1941, the plant generated 2,795,200 kw.hrs. for 998 consumers at a net profit, after depreciation, of $24,213.94. Below is the picture of the expansion at approximately 10 year intervals.

In the sixteen years since the installation of the first Diesel, the municipal utility has shown a net profit after depreciation of more than $275,000.00. From 1926 on, the total cost of plant equipment and expansion of the distribution system has been paid out of plant earnings with substantial profits left over.

Year	*Kw.Hrs. Generated*	*Number of Consumers*	*Net Profit*
1911	160,258	206	$733.00 (loss)
1920	435,760	424	$3,603.44 (loss)
1930	1,175,550	675	$19,356.91 (profit)
1940	2,502,700	940	$22,772.10 (profit)
1941	2,795,200	998	$24,213.94 (profit)

The sole source of these financial benefits is the efficiency of Cedarburg's Diesel plant. All equipment was chosen for long-range, economical performance and the results have justified the choice. The table on the following page gives monthly operating data for the year 1941 and shows a plant average of 11.25 kw. hrs. per gallon of fuel. The 1000 hp. unit, which embodies more modern features of Nordberg design, delivered 12.26 kw.hrs. per gallon of fuel. The plant's record of success in meeting lubrication problems is even greater. Sinclair Rubilene is used in the crankcase cir-

culation system which supplies the bearings. For lubrication of all cylinders and compressors, Cedarburg engineers have chosen Macmillan Ringfree. The results have surpassed expectations. Not once in all the years of operation have the operators found a stuck ring. Careful records are kept of all maintenance work and they show that cylinder wear has been exceedingly small. In 1941, the plant operated more than 5500 rated horsepower hours per gallon of lubricating oil consumed. In this year, the 1000 hp. unit recorded 5979 hp. hrs. per gallon. Figures available for the first five months of 1942 show that the big engine is returning 7,698 rated hp.hrs. for each gallon of lubricating oil consumed. The total cost of lubricating the plant in 1941 was less than $.00024 per kilowatt-hour. The crankcase system includes a Schutte & Koerting lube cooler and strainer for each engine. In addition, part of the oil is pumped from each sump tank to an individual Honan-Crane activated clay purifier where it is cleaned and then returned to the engine crankcase. Each engine is equipped with a motor-driven auxiliary lubricating oil pump which can be used in emergency to pump oil to the bearings and is used normally to keep up pressure in starting and stopping the engine. As a convenience to eliminate hand oiling, the outboard bearings are hooked to the lube circuit. Cylinders and compressors are supplied with lube oil by Manzel mechanical lubricators.

Air injection engines were chosen to permit efficient combustion of heavy fuel. Sinclair Diesel fuel of 24 to 26 gravity is delivered by tank car and unloaded by gravity into two underground tanks with combined capacity of 38,000 gallons. Two motor-driven rotary pumps are used to transfer fuel to the 500 gallon day tanks buried just outside the plant. There is a King Telegage on each day tank and the operator takes readings at the start and end of each shift. The engine's own supply pumps draw fuel from the day tanks. If these should fail, there are motor-driven auxiliary pumps to insure an unfailing supply of fuel. There is a centrifuge in the plant but the present supply of fuel is of such quality that no cleaning is deemed necessary. The big unit is equipped with a Woodward relay-type governor, the others with centrifugal governors.

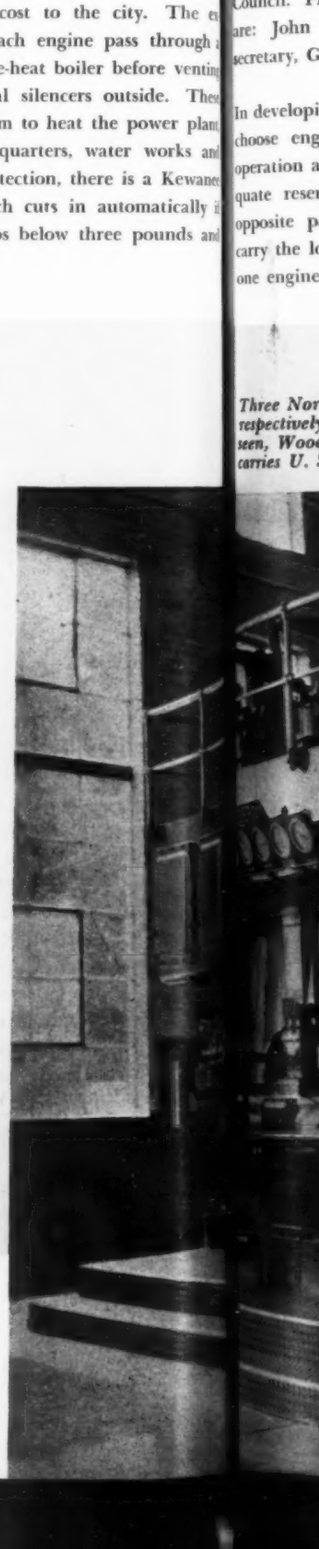
The cooling water system, too, reflects the determination to protect the Diesel and prevent forced shutdowns. One 500 gpm. and two 300 gpm. motor-driven American Marsh centrifugal pumps circulate soft water through the engine jackets and a common header to a 62,000 gal. underground concrete reservoir which provides all the cooling required. A Powers thermostatic valve automatically bypasses some of the water around the reservoir to hold temperature at the desired level.

Each engine has a connection to the city water supply through a Mueller automatic valve which is held closed by the pressure within the engine cooling system. Should the circulating pump fail, the valve would open admitting water under city pressure to the engine jackets. Cedarburg's veteran superintendent, Ernst E. Schneider, does not believe in taking automatic safety devices for granted. The pressure valves are tested every day. In addition there is an alarm system with Minneapolis Honeywell Pressuretrols on both lube and water pressure as well as a high-level alarm on the fuel tanks.

It is the practice in this plant to supplement convenient automatic devices with painstaking vigilance. There is a gauge board on each engine with U. S. pressure gauges for air, lube and water; there is an Alnor exhaust pyrometer, and there is a full set of Motoco thermometers. Operators thus have the means of checking on engine condition and record readings every hour. Pistons are pulled once a year for a thorough inspection and every effo is made to keep the prime movers in perfe condition throughout the year. All intake a for example, is drawn from outside the pla through a battery of Air-Maze impingemen type filters which are cleaned periodicall Still another convenience in this easy-to-opera plant is the motor-driven Gardner-Denv compressor which automatically keeps u pressure in the air bottles for starting or jac ing the engines.

The power plant is one of a group of publi buildings which form the Cedarburg Civi Center and the Diesels supply heat to all th buildings without cost to the city. The ex haust gases from each engine pass through a Davis Paracoil waste-heat boiler before venting through the vertical silencers outside. Thes boilers provide steam to heat the power plan city hall, fire headquarters, water works and jail. For added protection, there is a Kewaune oil-fired boiler which cuts in automatically i steam pressure drops below three pounds and

Month	*Hours Run*	*Kw. Hrs. Generated*	*Gal. of Fuel Consumed*	*Gal. Lube Consumed*
Jan. '41	744	220,900	20,665	88.5
Feb.	672	197,700	17,890	98.25
March	744	213,900	19,470	113
April	720	203,700	18,200	106
May	744	201,500	18,585	91.25
June	720	218,300	19,320	106
July	744	231,200	20,560	85.5
Aug.	744	249,500	22,000	82.75
Sept.	720	256,100	22,600	89
Oct.	744	270,700	23,575	88.75
Nov.	720	271,200	22,890	127.75
Dec.	744	260,500	22,540	92
Totals	8,760	2,795,200	248,295	1,168.75



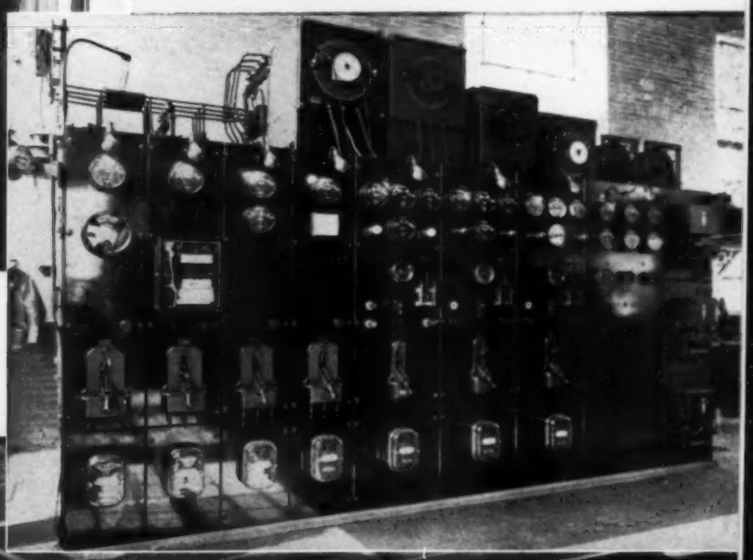
cuts out again at five pounds. This boiler has been used only rarely in the most extreme weather because the Diesels normally provide adequate heat. The nine-panel Westinghouse switchboard is fully equipped with Westinghouse instruments, oil circuit breakers, synchronizer, recording kilowatt meter, and totalizing kilowatt meters. There is a G.E. rocking-contact voltage regulator for each engine.

The power system has been managed since the installation of the first Diesel by a Light and Water Commission nominated by Mayor Herman E. Zeunart and appointed by the City Council. Present members of the Commission are: John Sieben, pres., Charles Bradburn, secretary, George Armbruster and Alwin Ruck.

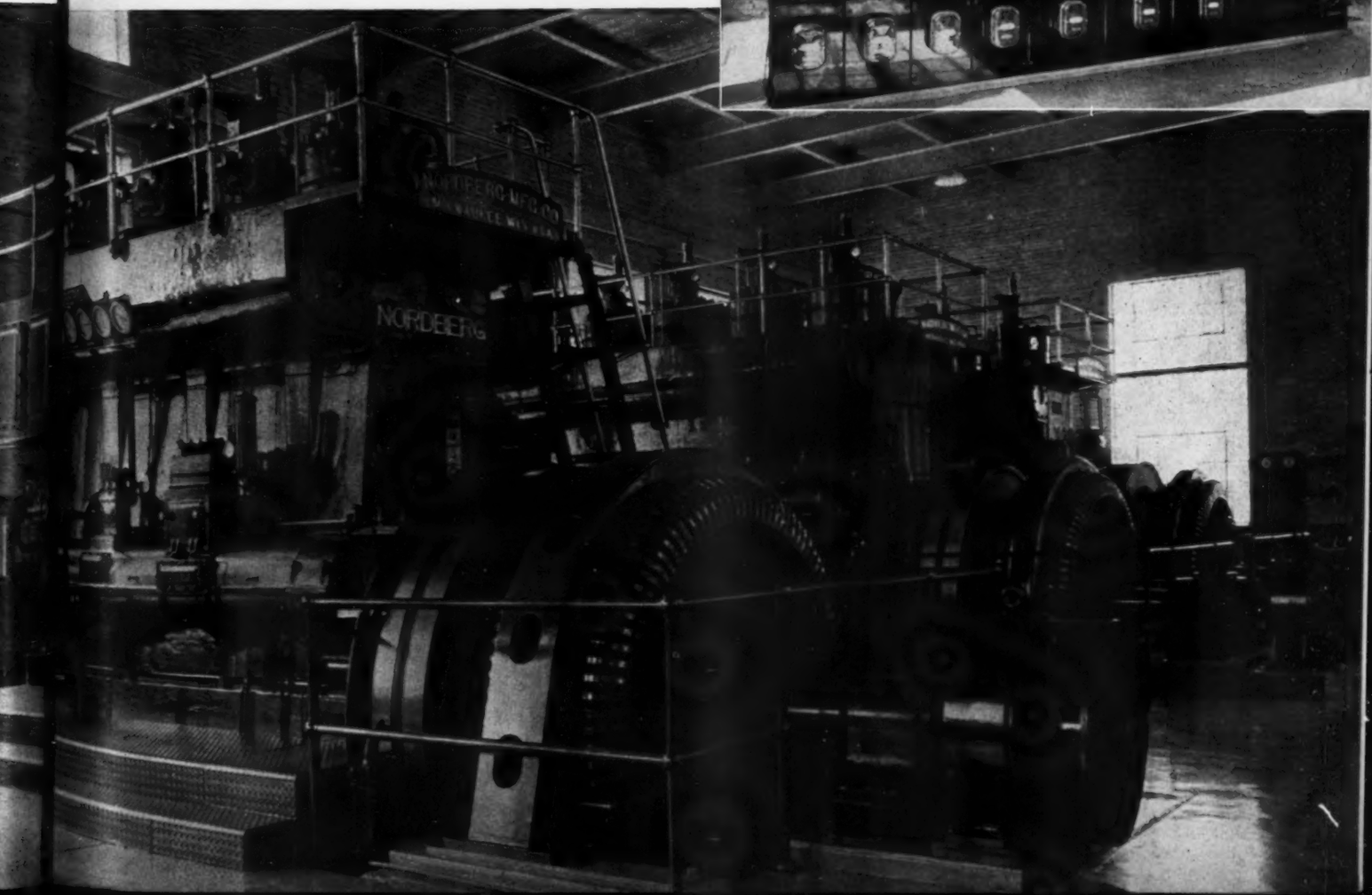
In developing the plant, an effort was made to choose engines of a size that would permit operation at good load factor and provide adequate reserves of power. The table on the opposite page shows that it was possible to carry the load throughout 1941 operating only one engine at a time, though the peak of 760 kw. was somewhat above the rated capacity of the 1000 hp. unit. Low fuel consumption is evidence of success in keeping the load factor up. This year peaks and production will be higher and it will be necessary to use two engines to meet maximum demand. With sales of electric appliances halted for the duration of the war, it is probable that the plant will be able to carry peak demands with any two engines leaving the third as an invaluable standby protection. With replacement of power units virtually impossible under present conditions, Cedarburg is fortunate in having a plant that was built for unfailing service, a plant that has never had a breakdown, a plant which today, after 140,000 hours, is at the peak of its efficiency.

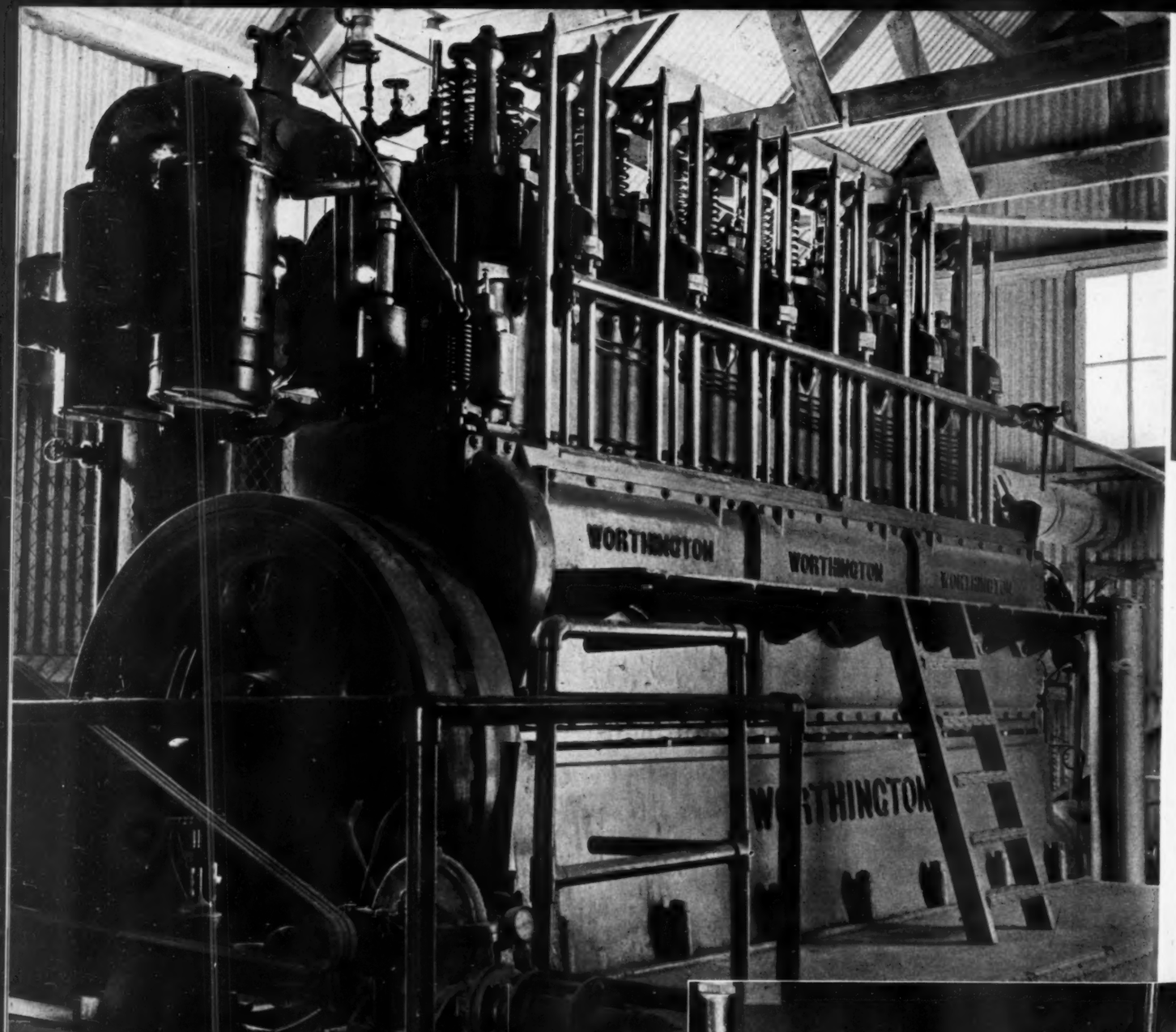
Alnor pyrometer and King Telegages to show fuel content of day tanks.

Westinghouse switchboard and switch gear with three General Electric voltage regulators, extreme right.



Three Nordberg Diesels, 1000 hp., 750 hp., and 450 hp., front to rear, respectively, and Allis-Chalmers generators. In the foreground are seen, Woodward governor and Manzel lubricators. The gauge panel carries U. S. pressure gauges.

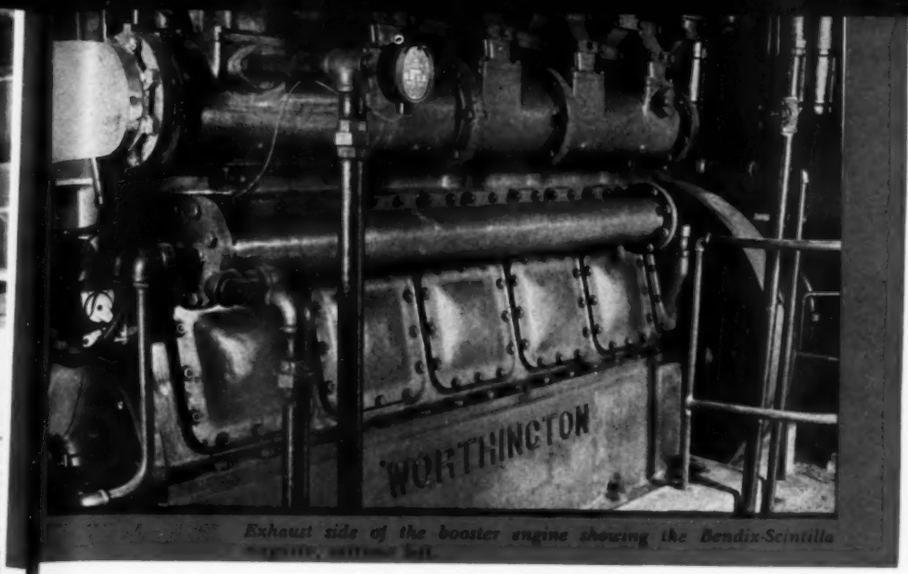




In this view of the main pumping engine is seen, upper left, twin Vortox air cleaners and Pickering governor, and lower right, Luber-Finer lube reclaimer.

Flywheel of the booster engine, Farrel speed increaser gear, Worthington centrifugal pump also starting air compressor and tank.

Main office and Judge Thomas Donnelly, Secretary of the Etiwanda Water Company.



Exhaust side of the booster engine showing the Bendix-Scintilla

GAS ENGINES AS CITRUS INSURANCE

By JIM MEDFORD

SOUTHERN California's life blood is water. To her 350,000 acres of citrus fruits, not to mention the large grape area, the average annual precipitation of approximately fifteen inches is totally inadequate for this great agricultural demand. Though large water development projects with their vast storage systems and distribution lines have aided tremendously in certain communities, particularly in the foothill country, it has been necessary to augment natural precipitation with run-off water from the various mountain streams that thread the canyon beds. In some years, however, as in 1925-1926, for instance, even this usual supply failed and compelled mutual water companies to turn to the idea of deepwell supply as crop insurance. Like the darkey and his pajamas, you can't take chances of being unprepared. The Etiwanda Water Company, on which the community depends for irrigation of its 2,000 acres lying in San Bernardino county, formerly in raisin grapes, but since replanted with citrus, acted promptly. They called in George Hinckley, a Riverside engineer, who put it up to a well driller, Roscoe Moss of Los Angeles. Said Roscoe to George: "I'll put you down a well that I'll guarantee to flow 100 inches, and I'll get it if it takes me down 1,000 feet—if it flows half an inch under the 100, she's yours for nothing!"

At 810 feet "she *flowed 200 inches,* levelling off at 400 feet below ground surface. "Juice" was the thing for power those days, and so the Etiwandas went electric—with a $3,000 standby charge to meet annually, whether or not a gallon of water was pumped. And, surprising as it may sound, some years not a drop was pumped. As I said in the beginning, it was crop insurance; necessary, no matter how costly. But some years later, in 1935 to be exact, though they had the water, the Etiwandas had lost some of their enthusiasm—knowing they had put up $3,000, whether or no, was not so good. And added to that fact it cost $1,400 per calendar month to get that water from only 400 feet below their feet. But they also remembered it had to be pushed up hill a matter of three miles. That is why there had always been two plants, the main at the well and a booster a mile and a quarter away, that pushed it up a mile and three-quarters to a top of 230 feet—in all a lift of 630 feet from water level.

The water company's board consists of five members; its present president is Glenn Shepherd, a prominent man in the community, and the secretary, always a board member, is Judge Thomas Donnelly. The water board secretary is a powerful man in any community, and being Irish, too, he didn't like that fixed charge of $3,000. He wanted a play for his money—and got it: crop insurance, with the premiums. Like most water companies the board hesitated because of one point only—electric power was automatic: Wouldn't gas engines have to be nursed by an attendant? But when it checked with the Worthington Pump and Machinery Corporation through the local Los Angeles office, it was satisfactorily shown that with improved methods of engine control, a complete automatic system could be installed. This was found not to be necessary, however, because the board's engineer, W. A. McKee, could handle the new power on a semi-automatic setup—manual start, automatic cutout.

At a cost of $25,000, two Worthington gas engines were installed—a six cylinder, four cycle, 360 hp. at 400 rpm. direct connected through outboard bearing to geared head, 190 inch, 1700 gpm. deepwell turbine pump dicharging at 80 pounds head pressure through 16 in. pipe into 1¼ mile distant discharge box from where, as needed, the other, a five cylinder, four cycle, 150 hp. at 510 rpm engine, through a centrifugal booster pump, delivers water at a three mile distant point for irrigation distribution by gravity through the usual ditches and laterals. A single unit coil inserted in the discharge line immediately ahead of the pump, is connected through a surge tank and hooked up with a supply tank located high in the engine room for engine cooling.

And so the Etiwandas got their crop insurance which they analyze in this "saving" way: average yearly operation—five months; average operating cost per month—electric, $1,400, gas engines—$5; years not run, and there are some —$3,000 standby charge saved! Adding all charges, including installation, operation, interest, etc., and based on five months' operation each year, the board estimates the plant as paying for itself in five years. After that, it's production assurance for half a century, with "money in the bank."

Equipment items, in addition to Worthington gas engines, include: air compressors, outboard self-aligning bearings, centrifugal booster pump, also by Worthington; governors by Pickering; lube oil Texaco SAE 30; lube oil filter by Luber-Finer; intake air filtered by Vortox; exhaust silenced by Burgess; lubricators by Manzel Bros.; impulse couplers by Bendix; increasing gears by Farrel; gauges by Ashcroft and U. S. Gauge; thermo control valves are Mercoid and Aquastat; lube oil pressure controlled by Minneapolis-Honeywell; water valves by Crane; piston rings are American Hammered.

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"KEEPING THEM ROLLING"

By R. L. GREGORY*

DURING the past few weeks the writer has noted some incidents which will be of interest to the readers of this section, since these observations show what can happen unintentionally to slow down our war effort. From them we can learn a lesson.

We, who are connected with the Power Plants of this country, are all vitally interested in maintaining a constant flow of electrical energy to our industries and homes. We are interested not only because it is our job to see that we give service to our communities, but as a matter of loyalty and duty to the land of our birth or adoption, as the case may be. We want to "keep them rolling" so that we, our children, and our children's children may continue to enjoy life, liberty, and the pursuit of happiness. We are interested because we know that the Power Plants are the very heart of our productive efforts, and without electrical energy, our efforts would soon bog down.

There are two classes of breakdowns: those which can be avoided if proper and timely steps are taken with equipment, when weaknesses in it or its operation are known prior to the breakdown. Then there is the second unavoidable class, where mechanical weakness, metal fatigue or wear has occurred during operation, and is not detectable by the personnel until it occurs. The following are instances of these two classes of breakdowns:

Two years ago, this month, the writer visited a certain municipal power plant, equipment consisted of four identical Diesel driven generating units. This plant was well attended and kept up and it had one advantage that many of our plants today do not enjoy, that of having 100 percent reserve capacity. Any two of the units in this plant could handle all the demands made upon the plant, so the personnel had ample time to keep the unoperative units in first-class operating condition. But the plant had one avoidable condition which has caused a great deal of trouble. Their system of grounding of the electrical equipment was very poor and, in fact, almost useless.

At the time the writer visited the plant, they had experienced, a few days previous, one of the worst electrical storms in years. Lightning had entered the plant, damaged some of the control equipment and had burned out the two generators in operation at the time. These units were so completely out of commission that it was necessary to restack the generator iron and rewind both units, which any engineer knows is an expensive repair. This was in progress at the time of the writer's visit.

Inquiry proved that the grounding system of the electrical apparatus was inadequate and further questioning proved that the units were not insured so far as the electrical equipment was concerned and hence no inspection was made. I suggested that they put in a ground conductor of ample size on each unit and the switchboard frame and carry them to a properly grounded plate or series of plates, buried in a moist place and surrounded or covered with ample quantities of charcoal and rock salt. Or, if easier, to carry the ground conductor to some nearby water main, where an ample ground could be secured with the proper connection. Either one of these methods would have been inexpensive and would probably given them proper protection in ninety percent of their storms. If they had gone into a more elaborate system, they could have bought material which would have been practically fool proof and given ample protection.

A couple of weeks ago I visited the same plant and much to my surprise, I found another unit down with a burned-out generator, caused by lightning. To make a long story short, nothing had ever been done to correct the grounding system as found two years previous and they had not profited by that experience by that experience. The plant was in even worse shape so far as reserve capacity, since their load had grown to the extent of their having to use three units during part of each week day to meet the demands for current. With the fourth unit down, they had no reserve in case of any trouble with units that were operating. In addition to the expense of repairs, they were having trouble getting materials, since their priorities were of a low rating and the vendors could not immediately furnish repairs.

In another plant I found that the operators were having trouble with the air on the scavenger. For several days they could not get ample blast air and were of the opinion that the trouble lay in the unit itself, which they were unable to shut down until the end of the week. I asked the chief engineer if he had examined his air filters and he told me that he had cleaned the sections about six months previous and had sent one of the men up to inspect them and he had reported them to be okay. I suggested we take a look at them. The air filter was housed in a filter house on the roof of the plant and, after some climbing and maneuvering through other materials and piping, we got to the filter room.

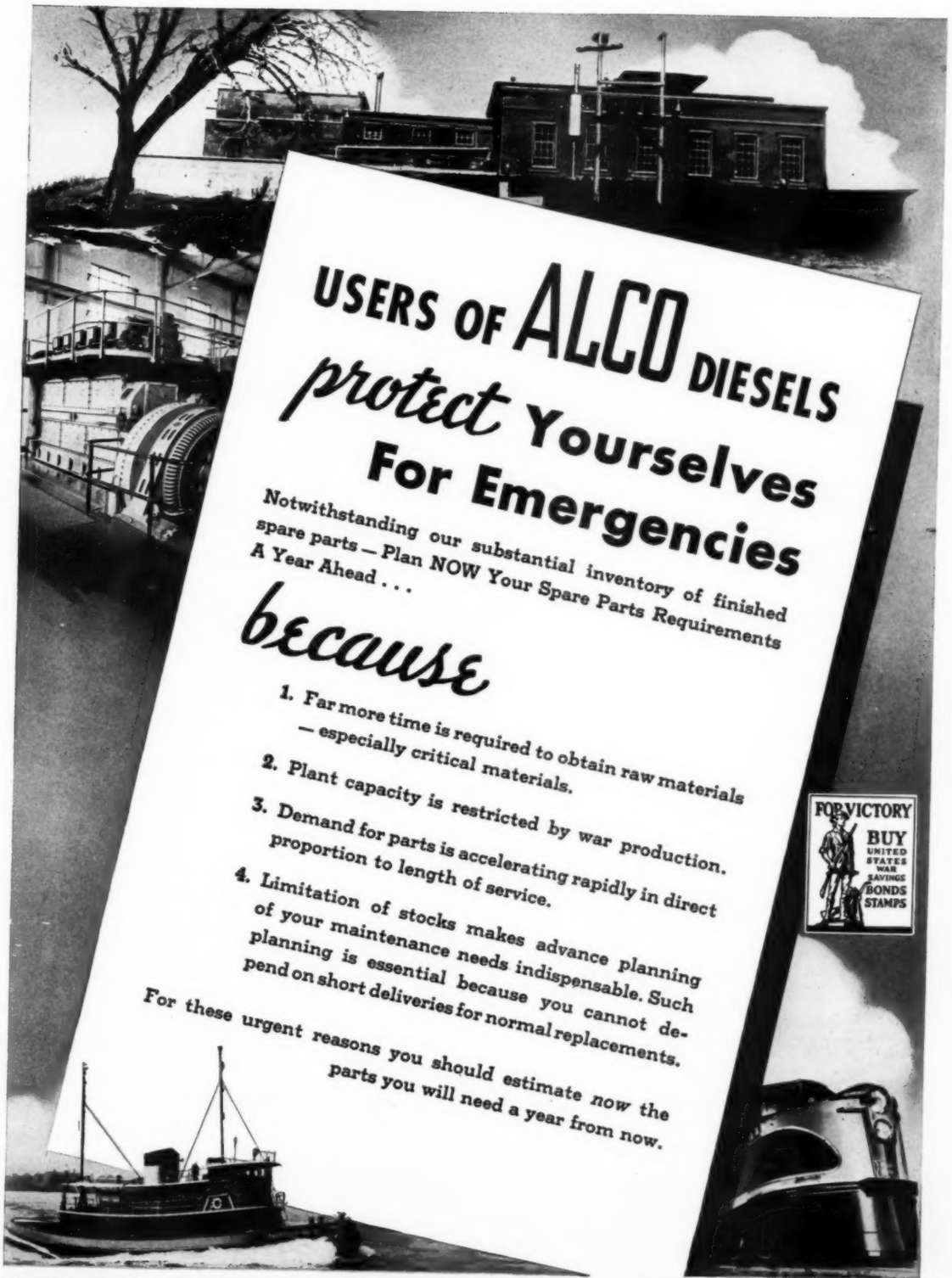
Upon entering it, we found the air filters practically plugged up with dust and dirt. He removed two sections of the filter and there was a rush of intake air. These he replaced with two spare sections which were clean. They then removed the sections, two at a time and cleaned them and the trouble disappeared. The mistake had been in not personally checking that angle of it himself, for they might have run into serious difficulty before they could have taken the unit out of service.

The foregoing incidents represent conditions that can be avoided, and such conditions lead me to wonder whether we realize the responsibility that rests upon our shoulders in order to "keep them rolling" as they must if we are to come out "on top of this heap."

I recall another incident which occurred a few years back, which is typical of unavoidable breakdown. This happened in a plant in which four units were operating in parallel on

. . . . *And now please turn to page 60* . . . .

* *Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.*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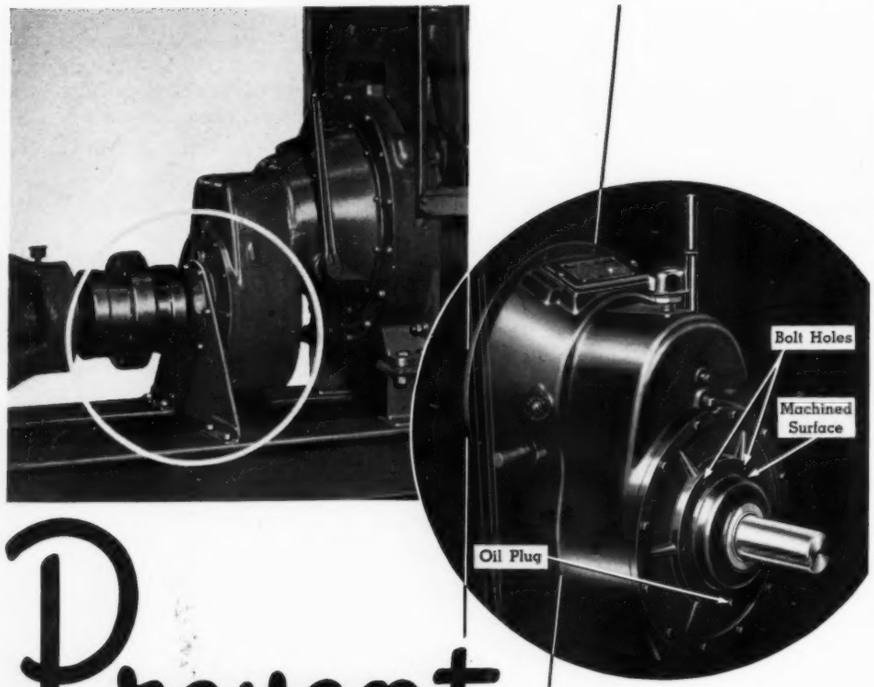

Prevent EXCESSIVE WEAR

Where pulleys and belts or a flexible coupling are used, a support plate, as shown in this illustration, will prevent a pull or twist when heavy side loads are applied. It will assure positive alignment and increase the working life of gears and bearings.

Note that the support consists of a steel plate, cut to fit. The weight of the steel plate should be in proportion to the size of the reduction gear and the maximum load which is to be applied.

Bolt or weld the plate to the engine's sub-base or mounting; carefully align, using shims if necessary, to assure correct adjustment.

For full instructions, see your engine representative, your Twin Disc dealer or write direct to the Twin Disc Clutch Company, Racine, Wisconsin, for Service Bulletin SB-113.

Illustration at top left shows the CORRECT *installation of a gusset or support plate to* PREVENT *misalignment and undue wear of gears, shaft and bearings, when using a Twin Disc Reduction Gear.*

1. *Machine the plate to fit snugly against the machined surface of the case.*
2. *Drill holes in the plate to match those already drilled and tapped on the machined surface of the reduction gear.*
3. *Allow a hole or groove in the plate to clear the oil plug.*

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. . . . *Continued from page 56* . . .

the line. There was an exceptionally ha bump on the system, and one of the small units showed signs of distress. Investigati showed that the generator shaft which wa in. in diameter, had broken between the bea ing and generator coupling. The unit was sh down and investigation proved that it w metal fatigue, the shaft having crystallized an cracked at this point. When the heavy surg hit it, the break was finished. The crack w so minute that it would have been difficult t see it with the naked eye.

These instances represent delays, repairs an added expense. The first two cited could ha been avoided by a little thought and effor It is going to take work, sweat, perseveranc and lots of "Good Old Yankee Ingenuity," a one engineer expressed it, to "Keep the Rolling" on to Victory. Such instances shoul ha e a moral and be an inspiration to all t us responsible for the Nation's Power Outpu

Reserve YOUR copy of the new Diesel Engine Catalog. Use the convenient coupon on page fifty-five.

B. B. Williams Shows Part Diesels Are Playing In Wartime Marine Construction

OVER 400,000 horsepower of Diesel engine were installed in 391 vessels added to the coun try's merchant marine in twelve months, ac cording to B. B. Williams, president and chair man, The Cooper-Bessemer Corp.

"The merchant marine vessel construction pro gram has recognized the Diesel engine as t boom to wartime economy, speed, and safety of operation," Williams said. "This is proved by the Maritime Commission's inclusion o 377,625 horsepower of Diesel propulsion en gines alone, to which about 38,000 more should be added for auxiliary engines."

The new Diesel vessels added to the merchant fleet, according to Williams, range from small wooden cargo craft of seven gross tons and 4 horsepower, up to large steel tankers of 11,33 gross tons with 7,500 horsepower.

Represented in this production program o Diesel ships are yards in over thirty states, a well as Alaska and Hawaii.

"Credit for increased speed in shipbuildin should be given to the U. S. Maritime Com

mission and private shipyards who have displayed outstanding initiative in the speedy development of America's shipbuilding equipment. In cooperation with the Commission, shipyards throughout the nation have established training schools for shipbuilders in order that they may meet the peak requirement of 600,000 to 700,000 men by late 1942. Ordinarily, there have been less than 100,000 skilled men thus employed.

"Training facilities have been more than doubled to supply the vitally needed men for the ships of America's newly expanded merchant marine. The Maritime Commission estimates that 6,300 licensed officers and 25,000 trained seamen will be available from that source alone at the close of 1943. This represents about two-thirds of the additional number that will be required."

Williams was also enthusiastic over the enlarged facilities of the private shipyards. "Yards capable of building 400 foot or larger ocean-going merchant vessels have increased from 10 with 46 ways in 1937 to 40 with 275 ways. This represents an increase of about 500%."

Lebanon, Ohio, Reports Excellent Lube Oil Economy

RECEIVED TOO LATE for inclusion in the article on Lebanon, Ohio, by W. T. Burgess, which appeared in the July issue of DIESEL PROGRESS, the following figures are of interest. Operating records of this plant show that it is developing 14,870 rated brake horsepower hours per gallon of lube oil. Three thousand rated brake horsepower hours per gallon of lube oil is considered good for units of this size under average conditions. It will be remembered that these engines are two Cooper-Bessemer, 8 cylinder, 1,000 hp., 300 rpm. Diesels.

Five dollars buys the new edition of the Diesel Engine Catalog which went into the mails on July 31.

Rotary Positive Blower Bulletin

ROTARY positive blowers are covered by Bulletin 22:23-B-11, comprising twenty pages, just issued by the Roots-Connersville Blower Corp., Connersville, Indiana. This bulletin is profusely illustrated, showing numerous installation views, details of construction, etc.

On the inside front cover will be found a brief account of the inception of the rotary positive blower by the Roots brothers, who patented the

The three power units in the Cedarburg, Wisconsin, Municipal Power Plant are Nordberg Diesels totalling 2,200 hp. The largest and newest unit, seen in the foreground above, is a 4-cylinder, 1,000 hp. engine installed in 1926. An "Alnor", rectangular type, multipoint pyrometer is installed for engine protection.

"Alnor" helps maintain continuous service at Cedarburg, Wisconsin

The records at this plant, going back sixteen years, show 140,000 engine operating hours without a breakdown—not one interruption of service due to failure of plant machinery. It is such records that "Alnor" pyrometer protection is helping to establish every day of the year — wherever Diesel engines are serving communities, industries, marine and land shipping—and in our armed forces. "Alnor" will help to keep these vital prime movers unfailingly on the job through these crucial times and will assure efficient performance in the years to come.

Buy or specify "Alnor"
Ask for catalog

Illinois Testing Laboratories Inc.
(Pond Guess Know!)
423 NORTH LaSALLE STREET, CHICAGO, ILLINOIS
MANUFACTURERS OF "ALNOR" AND PRICE INSTRUMENTS • PRODUCTS OF 42 YEARS' EXPERIENCE

principle in 1859. On pages four and five, three interesting curves are presented in connection with a discussion of the operating principle of these blowers.

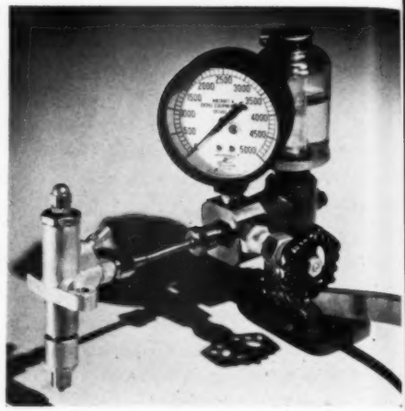
Page Six presents views of four different types of gears in matched pairs, and the manufacturer stresses the importance of accurate gear cutting. On the opposite page are sectional views of standard blower types. Following this are eight pages of installation views and comment regarding the many varied applications which rotary positive blowers have found in a diversity of industry. On pages sixteen and seventeen typical accessories are shown and discussed in considerable detail. Specifications are given on page eighteen, and the inside back cover is devoted to a table of sizes, including capacity, speed, horsepower, etc.

A copy of this bulletin may be had by writing to Connersville or by addressing the company at N. Y., Chicago, Pottstown, Pa., Pittsburgh, Boston, Detroit, St. Louis, or San Francisco.

Features...
DIESEL OPERATORS
WILL LIKE ABOUT
Eclipse aviation SEAMLESS
FLEXIBLE METAL HOSE
SEAMLESS
FLEXIBLE
DURABLE
MINIMUM WEIGHT
These features render Eclipse hose especially adapted for use in Diesel exhaust, water, and oil connections because:
* Seamless—means long lived; leak-proof.
* Flexible—means absorption of operating frequencies.
* Durable—means perfection of materials and manufacture.
* Minimum weight—means light weight construction obtained by the use of selected alloys specially heat treated.
Eclipse Seamless Flexible Metal Hose is supplied with single or multiple braided covering and armor casing, also in double wall types for air or water jacketed exhaust lines.
Write for bulletin
ECLIPSE AVIATION
SEAMLESS FLEXIBLE METAL HOSE
MANUFACTURED AND SOLD BY
DEPT. 24 • PHILA. DIV. • BENDIX AVIATION CORPORATION

Adeco Issues Nozzle Tester Bulletin

A NEW BULLETIN, covering its hand pump for testing fuel injection equipment, has been issued by Aircraft & Diesel Equipment Corporation. This four page bulletin describes the many uses of the Adeco hand pump in checking injector opening pressure, spray pattern, stuck needle valves, and leakage around valve seats and in checking injectors on the engine with the compact, portable pump unit. Sec-



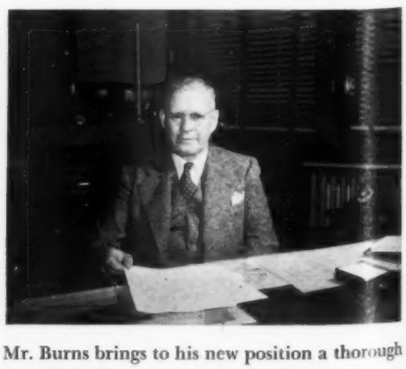
ADECO Diesel Nozzle Tester

tional and analytical drawings of the unit are given together with illustrations of various adapter tubes for testing all makes of injection equipment. A copy of the nozzle tester bulletin will be sent upon request to Aircraft & Diesel Equipment Corporation, 4405 North Ravenswood Ave., Chicago, Illinois.

Volume Seven of the Diesel Engine Catalog came off the press on July 31. See pages 54 and 55.

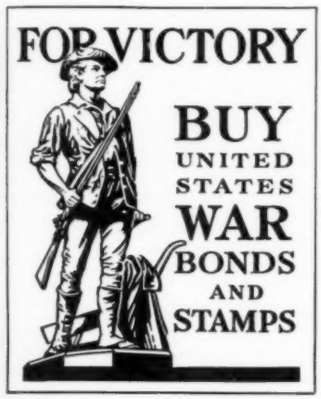
National Supply Appoints T. W. Burns

THE NATIONAL Supply Company announces the appointment of Mr. T. W. Burns as Works Manager of the plant of the Superior Engine Division, located at Springfield, Ohio.



Mr. Burns brings to his new position a thorough knowledge of factory methods, systems, and pro-

duction efficiency gained through many years of experience in shop management. He was for many years associated with Fairbanks, Morse & Co. in various executive positions. After some twelve years as Works Manager of their Beloit, Wisconsin, plant, he resigned to accept a similar post with the A. O. Smith Corporation of Milwaukee where he has been until his recent decision to join the National Supply Company.



hio Crankease Appoints eward A. Covert

THE OHIO CRANKSHAFT Company, Cleveland, announces the appointment of Seward A. Covert as Assistant to the President in charge of Public Relations and Industrial Publicity. William C. Dunn is company president.

Mr. Covert has served Ohio Crankshaft as Public Relations Counselor for more than a year while associated with Graves Taylor & Associates, Cleveland. He will continue to promote the company's extensive War Production Drive program in conjunction with other duties.

ee pages 54 and 55 for details of the test and the best book on Diesel ngines.

est Coast Diesel News

ANOTHER Navy "E" pennant has been warded to a West Coast shipyard, the Bellingham (Washington) Marine Railway and Boat-uilding Co., for minesweeper construction. hey also have contracts for two 183-ft. ivage tugs, twin screw, Diesel Electric drive ith Cooper-Bessemer engines.

ATERPILLAR Diesels have been selected power several V-bottom scows under con-ruction by the Maritime Shipyards, Inc., attle, Washington. They are reported to be the U. S. Army.

For Conservation of Lube Oil
FILTER WITH MICHIANA

Clean lube oil insures "full" power, oil conservation, better all-round dependable engine performance. To be sure of clean oil properly engineered and designed filters of adequate capacity for the engine and its usage, are now available. Through long years of Filter manufacturing, through close cooperation with engine builders,—through the experience gained in actual application of tens of thousands of Filters, MICHIANA offers a practical solution,—a line of Filters to meet the exacting demands of today.

Michiana Filters are widely used with Diesel engines on truck, tractor and construction equipment,—on streamline trains and switch engines,—on tugs, towboats, barges, tankers, tenders, speed boats, torpedo boats and other Naval and Merchant Marine vessels.

This same element used in Diesel Filters of 163 to 1633 H.P. capacities. The Model 17050 Filter has one of these Elements. Filters of 50, 100 and 150 H.P. capacity are also included in the MICHIANA line.

Model 19800 MICHIANA Filter has four standard filter elements as above—653 H.P.

Filter Elements Alike For All Filter Capacities

Single Filters are made in capacities up to 1633 H.P. and may be used in groups for various other capacities. *All filter elements* are alike being used singly or in sets of three, four, six, seven and ten according to capacity. Where filters of different capacities are used stocking of spare elements is thus simplified.

Elements are available in either the Re-Packable Type for lowest possible maintenance cost,—or the Replaceable or Cartridge Type for quick servicing. With this type the used cartridge is removed and another placed over the center tube of the filter.

For full power,—for lube oil conservation,—for better all-round performance and fewer shutdowns, keep your engines clean with MICHIANA Filters . . Write for new Bulletin 42-D. MICHIANA PRODUCTS CORPORATION, Michigan City, Indiana.

MICHIANA
OIL FILTERS
for Diesel Engines

THE 68-ft. purse seiner *Genevieve H* owned by Captain M. O. Medina is being reconditioned and equipped with a new 30 hp. Diesel by Crofton Diesel Engine Co., Fisherman's Wharf, San Diego, California. Her main engine is a 135 hp. Washington Diesel.

RECENTLY completed by the Art Jacobson yard, Seattle, Washington, for Nystrom and Hammer, the 43 ft. salmon troller *Victory* is powered with a 60 hp. Caterpillar Marine Diesel.

EXPANSION of the boatbuilding plant of Anderson and Christofani at Hunter's Point, San Francisco, has required new equipment including a Caterpillar Diesel mobile crane for yard use.

THE 57 ft. seiners *Wonderful* and *Polarland* for the Martinis Brothers of Everett, Washington, will be powered with 110 hp. Atlas Imperial Diesels and have Exide batteries installed by the builders, Harold Hansen Boat Co., Seattle, Washington.

AT THE Bellingham Marine Ways, Bellingham, Washington, order for eight minesweepers for the Navy Department, has been received. Power will be twin General Motors Diesels.

SALES OF Caterpillar marine Diesels to Northwestern boat owners include a 70 hp. engine to John Dragovich, Everett, Washington; a 60 hp. engine to Arthur Degerstrom, Seattle, Washington.

THE LARGEST V-bottom power scow ever constructed for the Alaska Salmon Fisheries has been completed by the Maritime Shipyards, Seattle, Washington. Power plants are twin 100 hp. Superior Diesels.

AT THE Lynch Shipbuilding yard in San Diego, California, General Motors Diesels are to be installed in six minesweepers for the Navy Department.

THE COASTAL Towing Co. of Vancouver, B. C., has installed a 100 hp. Mack marine Diesel with Twin Disc gears in its 70 ft. tug *Fearless,* replacing a steam plant.

SOLTA, 60 ft. purse seiner owned by Captain Emil Leese, Seattle, Washington, has been repowered with a 95 hp. Caterpillar marine Diesel.

RECENT installations of Mack marine Diesels include a 70 hp. in the troller *Margaret* for Harold Hunter, Marshfield, Oregon; and a 100 hp. with Twin Disc 3 to 1 reduction gear in the tug *Port Edward* for the Shingle Bay Packing Co.

TWIN 100 hp. Superior Diesels power the 76-ft. power scow constructed by the Maritime Shipyards, Seattle, Washington, for P. E. Harris Company, same city.

FIVE 600 hp. at 400 rpm., 8-cylinder Cooper-Bessemer Diesels direct connected to 2,400 volt, 60 cycle Westinghouse generators have been installed by the Belridge Oil Company in their North Belridge field in the San Joaquin valley, California.

A WASHINGTON 240 hp. Diesel is the propulsion engine in the new seiner *City of Seattle,* an 80 ft. craft, for Conny Ness by the Marine View Boat Building Co., Tacoma, Washington.

ANNA A, 54 ft. halibut boat by Union Boat Works, Vancouver, B. C., for Pete Anderson

MARBLEHEAD, MASS. DIESEL POWER PLANT

Eliminates Operating Difficulties and Increases Output 50,000 KW

CHIEF ENGINEER JOHN H. TATTERFIELD USING PREMAX ON ALCO-SULZER DIESEL

Cylinder pressures are read directly with the simplified PREMAX Indicator—no scaling of diagrams or calculating required. The instrument is easily attachable to any diesel, including the latest automotive types. Anyone can use it to get accurate readings at all engine speeds.

WITH A *Direct-Reading* **PREMAX** PRESSURE INDICATOR

The Chief Engineer at Marblehead says, "Before using the PREMAX Pressure Indicator we had trouble keeping head gaskets on, due to high pressures. The difficulty has been eliminated by reading cylinder pressures with the PREMAX and setting fuel pumps to get proper injection and timing. The indicator has solved the problem of maintaining efficient engine operation and consequently has helped us to obtain approximately one KW more power per gallon of fuel."

You, too, can step up the efficiency of your diesels by checking compression and firing pressures regularly with the PREMAX Pressure Indicator. It is an amazingly simplified precision-testing instrument that instantly indicates true cylinder pressure conditions. Its use is protection against high firing pressure in any one cylinder which may cause damage, or poor compression pressure that causes loss of power, sluggish acceleration, smoky exhaust and starting difficulties.

Our file of case studies indicates that using the PREMAX assures uninterrupted power and maximum fuel efficiency—that it pays for itself many times over through fuel savings and maintenance economies. Our new bulletin gives full particulars. Send coupon for it today. No obligation.

USE PREMAX SAVE FUEL PROTECT PRECISION PARTS — HELP THE VICTORY PROGRAM

MAIL *Now*

SEND ME PREMAX BULLETIN 283

Name _____

Address _____

City _____ State _____

We Operate _____ Make of Engine

No. Cylinders _____ H.P. _____ R.P.M. _____

BACHARACH INDUSTRIAL INSTRUMENT CO.

7000 BENNETT ST., PITTSBURGH, PA.

is powered with 6 cylinder Buda Diesel with Twin Disc reduction and reverse gears.

AT KETCHIKAN, Alaska, West Waterways Shipyards have delivered to L. P. Sunderland the new 67 ft. salmon seiner recently completed by their Seattle yard.

HOLY TRINITY, new 65 ft. short range tuna fishing vessel completed for a group of San Diego fishermen by Campbell Machine Co., same place, is powered with a 200 hp. Cummins Diesel.

WASHINGTON 200 hp. twin Diesels have now been selected for powering the 135 ft. tuna clipper *Conte Grande* building for Andrew Castagnola by the Campbell Machine Co., San Diego, California.

THE WEST Coast shark fishing industry gets another Gray marine Diesel engined craft, the 39 ft. *Laverne* by Jack Eremenko for Manuel Figueredo, both of Fort Bragg, California. Exide batteries have been installed.

WEST Waterways Shipyards, Seattle, Washington, have completed a 56 ft. salmon purse seiner for John Vitalich also of Seattle. Power is a 110 hp. Atlas Imperial Diesel.

THE MARINE Boat Building Company of Seattle, Washington, recently completed a 80 ft. purse seiner powered with a 200 hp. Cooper-Bessemer Diesel for Edwards and Anderson.

LeTourneau Appoints ExecutiveVice-President

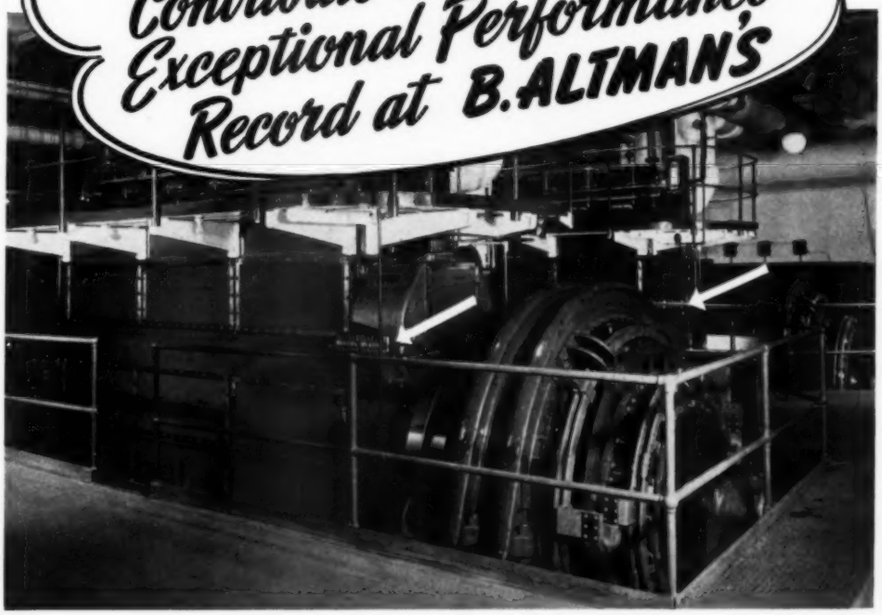
Murray M. Baker

TO COORDINATE the executive activities of the fast-growing LeTourneau company and thereby increase its effectiveness in the war effort, Murray M. Baker of Peoria, Illinois, has been appointed to the newly created post of executive vice-president, according to an announcement by R. G. LeTourneau, president. Baker enters on his new duties immediately and will make his headquarters at the Peoria plant of R. G. LeTourneau, Inc.

The new post was created to enable R. G. LeTourneau to devote a greater share of his time to the increased engineering activities made necessary by the war work of the company's four plants in Peoria, Illinois; Tournapull, Georgia; Vicksburg, Mississippi; and Stockton, California.

Murray M. Baker has been associated with earthmoving and heavy construction equipment since 1909 when the Holt Manufacturing Co., now Caterpiller Tractor Co., first established in Peoria, Illinois. His interest in LeTourneau was inspired during the early development period when Carryall Scrapers and Caterpillar

MANZEL LUBRICATORS Contribute to an Exceptional Performance Record at B. ALTMAN'S



45,000 engine hours without an enforced shut-down or major repair is only possible with dependable lubrication. That's the record run up by the two Manzel-lubricated McIntosh & Seymour Diesels installed four years ago by B. Altman & Co.

Their lubricating oil consumption—6,395 h.p. hours per gallon of lube oil—proves Manzel's efficiency and economy.

Manzels deliver oil in accurately metered amounts against any pressure usually found in Diesel engines. Feed is capable of very fine adjustment. Once set, the Manzel delivers exactly the desired amount of oil with each pump stroke.

All Manzel parts are of heavy construction and sight glasses are tested for 1500 lbs. pressure. Manzel's exclusive oil-sealed pumping plungers prevent air being drawn into the line regardless of oil level in the reservoir.

For full information on modern, force feed lubrication, write for Catalog 94-B.

MANZEL BROTHERS CO.
275-277 BABCOCK ST. BUFFALO, N.Y.

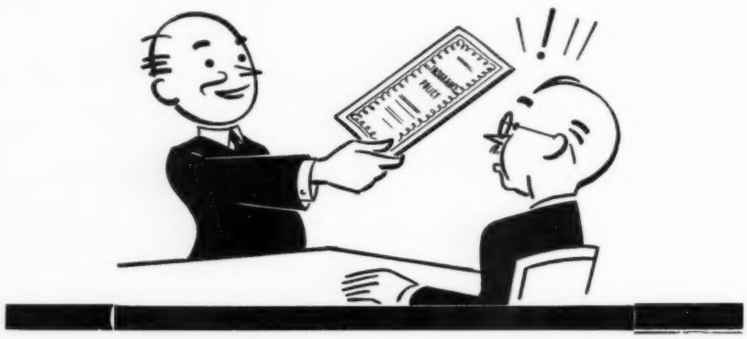
tractors became prominent in the Middle West and the East Coast. When LeTourneau came to Peoria, Baker was instrumental in picking the company's present manufacturing location. He has been a director of the company for the past four years.

Baker's chief job during World War I was in connection with the production of Caterpillar equipment for the Allied Governments at home and abroad and in collaboration with the Ordnance Department of the U. S. Army in preliminary development of the tank.

Volume Seven of the Diesel Engine Catalog came off the press on July 31. See pages 54 and 55.

Blackmer Issues New Rotary Pump Bulletin

BLACKMER Pump Company has just issued a general bulletin covering its line of swinging vane, "bucket design," rotary pumps. This twenty-four page bulletin, printed in two colors, covers the history of Blackmer rotary pumps and their application to the handling of all types of industrial liquids, an impressi list of outstanding users and a complete list available Blackmer specialized bulletins. Wri Blackmer Pump Company, 1968 Century Av S.W., Grand Rapids, Michigan, for your co of "Blackmer Rotary Pumps."



Here's Insurance that PREVENTS Damage

● Penn safety controls on your Diesels give you "full coverage protection" against delayed production schedules and damage caused by oil failure or cooling water failure.

You'll agree it's a wise policy to prevent such damage now, when speed in production is so vitally necessary. Penn controls also serve our all-out war effort by eliminating the need of constant personal supervision.

If an oil line is clogged or broken, or the oil pump fails, or the oil pressure drops dangerously low from any cause—or if the water system fails —the Penn safety control automatically sounds a warning alarm, or shuts down the engine, before damage occurs.

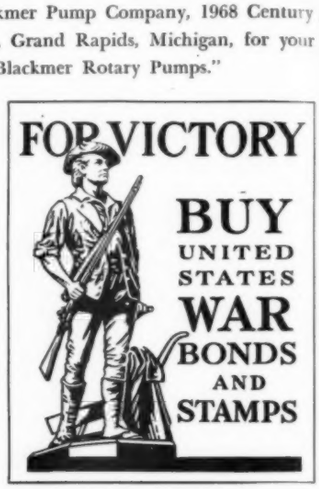
Put Penn safety Controls on your Diesel engines now and *keep 'em running!* Get complete information, without obligation . . . mail coupon today!

MAIL COUPON NOW FOR DETAILS

PENN ENGINE CONTROLS

PENN ELECTRIC SWITCH CO., Goshen, Indiana.
Please send me your Bulletin E100 on Penn Safety Controls for Diesel engines.

Firm Name .....
Individual .....*Position* .....
Address .....
City .....*State* .....



Luber-finer, Inc. Appoints William J. Denning

WILLIAM J. DENNING, newly appointed general manager of Luber-finer, Inc., Los Angeles, brings to this oil filter manufacturing firm a background of twenty-five years' ex-

William J. Denning

perience in manufacturing, engineering, and merchandising. Denning, a member of the Society of Automotive Engineers, has been General Manager of the Do-Ray Lamp Co. of Chicago for the past twelve years.

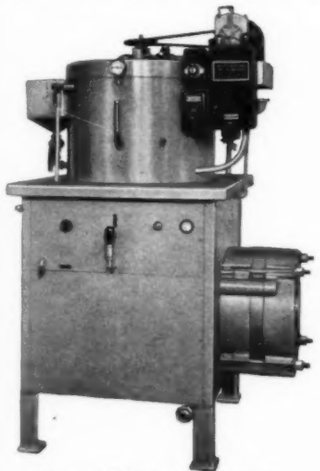
Buda Appoints Wm. T. Sanford

THE BUDA COMPANY of Harvey, Illinois, is pleased to announce the appointment of Mr. Wm. T. Sanford as Service Manager of the Railroad Division. Mr. Sanford has had wide experience in engineering and field service. He attended Bates College, Lewiston, Maine, and went through the Chrysler Engineering School and Hemphill Diesel Schools. He has served his six years with the Hoosick Electric Specialty

Company of Hoosick Falls, New York, in engineering development and designing of high dielectric molded material for magnetos, X-ray machines, aircraft ignitions, radios, etc. He has spent 2½ years with the Chrysler Corporation, Detroit, as automotive and Diesel field engineer; two years with Sinclair Refining Company, Chicago, as field engineer covering the State of Illinois; and three years with Socony-Vacuum Co., Chicago, in the same capacity.

New Engine Lube Oil Reclaimer and Purifier

THE HILLIARD Corporation recently added to its line, and went into production on its Hilco Airline Oil Purifier. This equipment utilizes the contact method of oil purifying and all processing is done under vacuum for the highest efficiency of filtering materials and to avoid oxidation of the oil being purified.



Hilco "Airline" Oil Purifier.

The oil to be purified is drawn, by vacuum, into the heater tank and thence to the Hilite, or Fullers Earth. The mixture is thoroughly agitated, and heated to the proper temperature, then dropped into a rundown tank. By means of compressed air, the oil is forced out through a blotter filter press which retains all solids. The oil is delivered to either drums or clean oil storage tanks.

The Hilite, or Fullers Earth, absorbs all solids, such as carbon, abrasives, dust, sludge, tarry matter and acids. The heating process evaporates all fuel dilution and moisture to restore flash, fire, and viscosity to the oil. It is said the process restores oil to the original value of new oil, and is very economical to operate. This type of equipment is vital at this time, as it is important to conserve resources, particularly petroleum products.

Informative literature is available on this and other types of oil purifiers, manufactured by Hilliard, by writing directly to The Hilliard Corporation, Dept. D.P., Elmira, New York.

Diesel Engines and Their Lubrication

A NEW SERVICE BULLETIN, No. 19 carrying the above title has been issued by Kendall Refining Company. This thirty-six page bulletin discusses in semi-technical terms the design and construction of Diesel engines emphasizing the differences between lubrication requirements of Diesels and other types of internal combustion engines. Many models of high speed Diesel engines are illustrated and discussed in this new bulletin. The current concept of high speed Diesel lubrication is discussed in the light of the latest developments in this field. A section of the bulletin is devoted to the operation of Diesel engines, the effect of overloading, overheating and overspeeding at start. This publication should prove to be a helpful addition to the files of Diesel engineers and operators. Free copies will be sent to those interested upon application to Kendall Refining Company, Bradford, Pa.

PAGES FROM A DIESEL ENGINEER'S SCRAPBOOK

(5)

TYPE & SIZE ENGINES: Diesel - 4000 to 150 H.P.

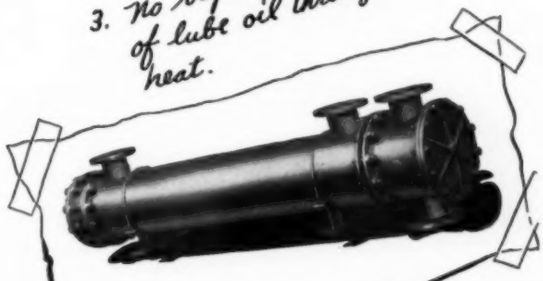
SERVICE: Marine

REQUIREMENT: Even temperature of lube oil and jacket water

HOW OBTAINABLE: Efficient rate of heat transfer.

RECOMMENDATION: Ross Type "CP" Coolers.

REASONS: 1. Large cooling surface.
2. Directed flow across tube surfaces.
3. No vaporizing or carbonizing of lube oil through excessive heat.



ronger
vidence
81% of
ica's Diesel
gine builders
Ross Coolers.

WRITE FOR YOUR FREE COPY OF BULLETIN 3622

ROSS HEATER & MFG. COMPANY, Inc.

Division of AMERICAN Radiator and "Standard" Sanitary Corporation

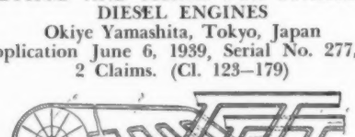
GENERAL OFFICES AND PLANT--BUFFALO, N. Y.

Latest Diesel Patents

A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.

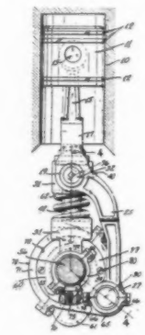
Conducted by C. CALVERT HINES*
Inquiries and Patent Work Solicited.

2,236,634
METHOD AND MEANS FOR STARTING DIESEL ENGINES
Okiye Yamashita, Tokyo, Japan
Application June 6, 1939, Serial No. 277,714
2 Claims. (Cl. 123—179)



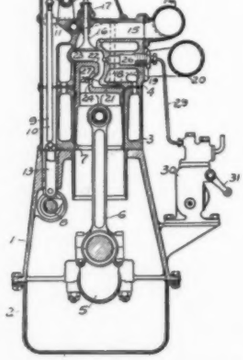
1. A Diesel engine for operation at abnormally low compression ratio comprising a supercharger, a valve controlling the passage of air to said super-charger, engine cylinders having exhaust and suction valves, separate connections between said super-charger and the suction valves, a change-over gear for adjusting the valves of certain of the engine cylinders for converting the latter into compressor cylinders to cause air to be drawn through the exhaust valves of the compressor cylinders and to be delivered through the suction valves thereof to the remaining engine cylinders, thereby supercharging said remaining cylinders to facilitate self-starting.

2,223,857
INTERNAL COMBUSTION ENGINE
Earl M. Trammell, Sr., and Earl M. Trammell, Jr., St. Louis, Mo., assignors of twenty-five one-hundredths to Irving J. McGuire, Dolgeville, N. Y.
Application August 24, 1939, Serial No. 291,680
13 Claims. (Cl. 74—36)



1. In an internal combustion engine, a power cylinder, a piston operable therein, a connecting rod, a crank pin and means associated with the rod for applying through the rod, during an early part of a power stroke of the piston, a portion of the thrust then imparted to the piston pivotally to the pin, and another such thrust portion torsionally to the pin.

2,234,844
INTERNAL COMBUSTION ENGINE
Courtney N. Mitchell, Strongsville, Ohio
Original application April 30, 1928, Serial No. 274,133. Divided and this application June 25, 1938, Serial No. 215,750.
3 Claims. (Cl. 123—32)



1. In an engine of the type described, a cylinder, a piston operating in said cylinder, a large combustion chamber, and a small combustion chamber, the piston having a projection adapted to enter the small combustion chamber to substantially isolate said chamber from the large combustion chamber during a part of the stroke of the piston to provide a substantial

* Patent Attorney, 811 E. Street, N.W., Washington, D. C.

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Modern research and testing laboratories . . . a competent staff of engineering specialists . . . complete manufacturing facilities . . . these are the vital reasons behind the high efficiency and exceptional performance records of YOUNG Marine Diesel Cooling Units and the complete line of heat transfer equipment for all types of stationary and mobile Diesel Engines. YOUNG's reputation for sound engineering and exacting research is your best guarantee of the right cooling unit, built to the rigid specifications of your requirements. Why not benefit by the quarter-century of heat transfer experience back of YOUNG products? YOUNG engineers will be glad to help you.

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The YOUNG marine heat exchanger above incorporates superior YOUNG-designed features of construction. Available in a wide range of sizes, and models for salt or fresh water use.

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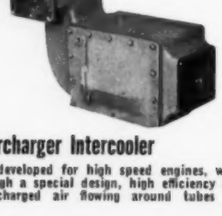
This YOUNG marine type unit combines the dual functions of engine jacket water and lube oil cooling into a single unusually compact assembly. Tube nest is easily cleaned.



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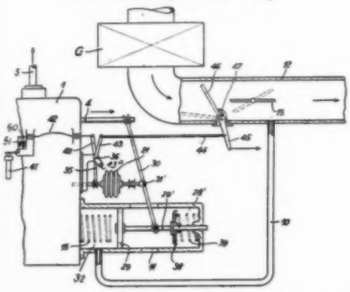
difference in pressure of gases in the two chambers, a valve controlling a flow of the gases, said valve being substantially coaxial with the aforesaid projection, means for establishing a passage between the combustion chambers before the completion of the aforesaid stroke to equalize the pressures in the two chambers by a sudden flow of a stream of the gases through the passage, and an injector disposed to inject fuel into said stream substantially at the time of maximum velocity of gases through the passage, the fuel being directed across the space between the projection of the piston and the aforesaid valve.

2,233,035

DEVICE FOR REGULATING THE AMOUNT OF FUEL DELIVERED TO INJECTION INTERNAL COMBUSTION ENGINES.

Alfred Schweizer and Max Hurst, Stuttgart, Germany, assignors to Robert Bosch Gesellschaft mit beschrankter Haftung, Stuttgart, Germany.

Application July 21, 1937, Serial No. 154,868
In Germany July 10, 1936
9 Claims. (Cl. 123-140)



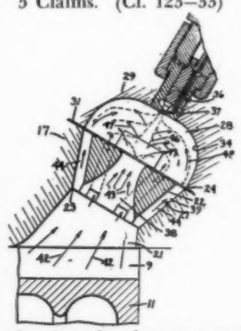
1. Apparatus for controlling the amount of fuel supplied to internal combustion engines having an induction pipe and which operate at constant and also sharply changing atmospheric pressures, comprising fuel controlling means for varying the amount of fuel supplied to said engine, a device sensitive to variations in pressure in said induction pipe, a device sensitive to variations in atmospheric temperature, a device sensitive to variations in atmospheric pressure, and mechanism operatively connecting said devices to said fuel controlling means whereby said means is automatically controlled and actuated jointly by said devices.

2,242,274

COMBUSTION CHAMBER FOR INTERNAL COMBUSTION ENGINES

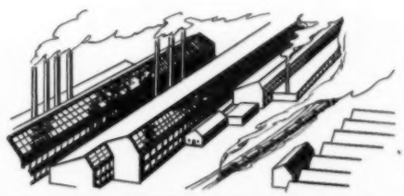
John Thysse, Alameda, Calif.

Application Sept. 1, 1937, Serial No. 161,993
5 Claims. (Cl. 123—33)



5. A combustion chamber construction for a Diesel type engine including an engine cylinder and a piston reciprocally mounted therein comprising, means providing a generally elongated chamber opening at one end to the head end of said cylinder and formed with an inverted substantially spherical dome shaped outer end and providing substantially the entire compressed air space in the top dead center position of said piston, fuel injection means adapted to direct a stream of oil into said chamber substantially axially from said outer end and providing a stream having a relatively small angle of divergence, the walls of said chamber at a portion intermediate the length thereof being invergently tapered in the direction of said outer chamber end, a frustro-conical member having the sides thereof tapered in conformity to the taper of said wall portion and fitted into said wall portion to separate said chamber into inner and outer portions each of substantial volume, said member having a central passage therethrough in substantially axial alignment with the axis of said chamber and said fuel injection means, and passage means providing a plurality of circumferentially spaced passages surrounding said center opening in said member and substantially paralleling and adjacent to the tapered sides of said member and chamber wall portion so as to communicate the inner and outer chamber portions, said last named passages opening into said outer chamber portion substantially tangentially to the dome shaped outer end whereby gases passing outwardly through said passages will be curved inwardly towards the axis of said chamber, said last named passages each having a smaller cross sectional area than said center opening.

Power INCREASED



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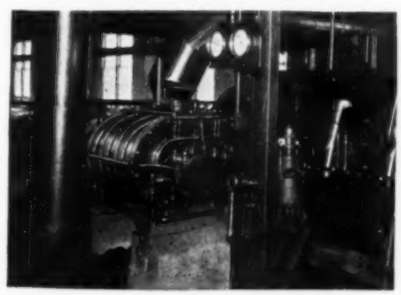

ON THE HOME FRONT

"R-C" Scavenging Blower installed in the power plant of a Western manufacturer. Changeover to blower scavenging increased Diesel engine power output by 20%.

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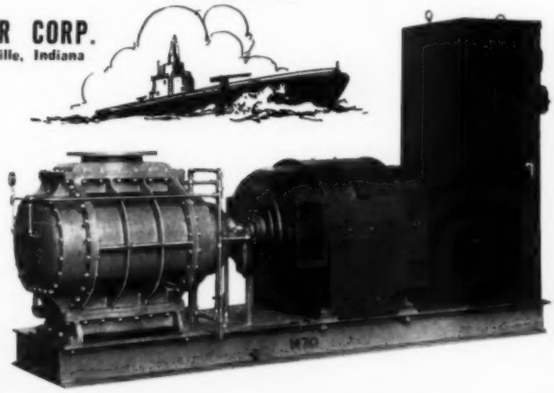

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Supercharging and Scavenging BLOWERS
All Out for Victory

Five dollars buys the new edition of the Diesel Engine Catalog which went into the mails on July 31.

2,234,005

DIESEL ENGINE LUBRICANT

Clarence M. Loane and Bernard H. Shoemaker, Hammond, Ind., assignors to Standard Oil Company, Chicago, Ill., a corporation of Indiana.

No Drawing. Application October 11, 1937, Serial No. 168,424

3 Claims. (Cl. 252-33)

1. A non-ring sticking Diesel engine lubricating oil consisting of a mineral lubricating oil adapted for use in Diesel engines and 0.5% to about 5% of an organic aluminum sulfonate derived from the petroleum sulfonic acid resulting from the treatment of mineral oils with concentrated sulfuric acid.

2,238,553

DIESEL ENGINE FUEL

Marvin L. Chappell, Berkeley, Calif., assignor to Standard Oil Company of California, San Francisco, Calif., a corporation of Delaware. No drawing. Application March 14, 1938. Serial No. 195,823

5 Claims. (Cl. 44—9)

1. The method of increasing the cetane number of a petroleum Diesel oil fraction boiling in the Diesel oil range and suitable for use as a Diesel fuel but having an undesirably low cetane number, which comprises treating said Diesel oil fraction with a diazonium salt at temperatures below about 40° F., in proportions sufficient to form diazonium salt reaction products in said Diesel oil fraction and to increase the cetane number, neutralizing the resulting mixture, and separating the water containing the dissolved salts of reaction from the Diesel oil fraction containing the diazonium salt reaction products in solution.

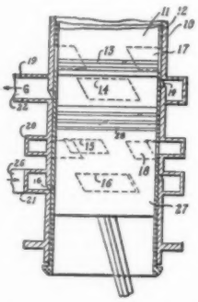
2,236,742

DIESEL ENGINE

Newell O. Allyn, Los Angeles, Calif.

Application October 2, 1939, Series No. 297,47[illegible]

15 Claims. (Cl. 123—65)



2. An engine comprising a cylinder provided with scavenging and exhaust ports, a piston in the cylinder, a sleeve valve between the piston and cylinder and provided with scavenging and exhaust ports, means to supply part of the slip stream to the scavenging ports, blower means connected to simultaneously supply air pressure to the scavenging port of the cylinder tangential thereto, the piston and sleeve being movable in timed movements with respect to each other.

2,234,612

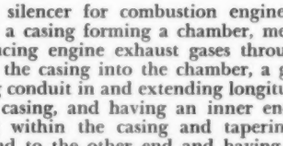
SILENCER FOR INTERNAL COMBUSTION ENGINES

Wilhelm Petersen Wold, Oslo, Norway, assignor to Wilhelm Petersen Wold and Adolf Eger, both of Oslo, Norway

Application August 4, 1938, Serial No. 223,190

In Denmark February 23, 1938

6 Claims. (Cl. 181—55)



1. A silencer for combustion engines, comprising a casing forming a chamber, means for introducing engine exhaust gases through one end of the casing into the chamber, a gas conducting conduit in and extending longitudinally of the casing, and having an inner end terminating within the casing and tapering from such end to the other end and having the reduced end extending through a wall of the casing to the exterior thereof to form a gas discharge port, the inner end of the conduit being closed and directed toward the said inlet means and said conduit having apertures formed in the wall thereof in that portion lying within the chamber.

2,237,970

STARTING DEVICE, PARTICULARLY FOR INTERNAL COMBUSTION ENGINES

Wilhelm Pabst, Hamburg, Germany

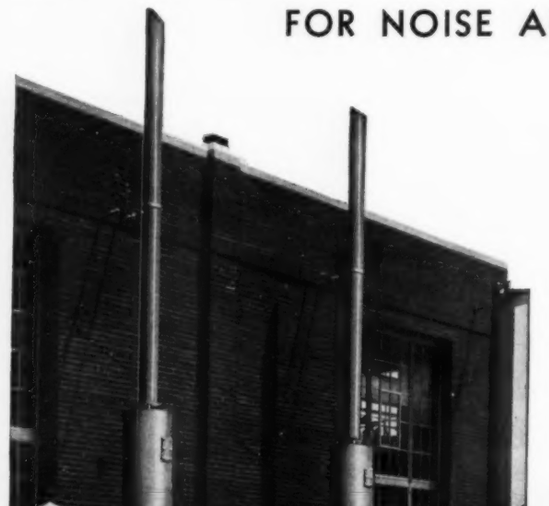
Application June 10, 1938, Serial No. 213,10[illegible]

In Germany June 25, 1937

3 Claims. (Cl. 121—37)

NEIGHBORS SAY "THANKS"

FOR NOISE ABATEMENT



Maxim Silencers installed on exhausts of 2 - 415 h.p. Diesels at Odessa, Mo. Power Plant.

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Maxim's many installations in utilities plants, like the one pictured above, prove that there is a definite objection to preventable noise . . . and that responsible plant operators are cooperating to suppress it wherever possible.

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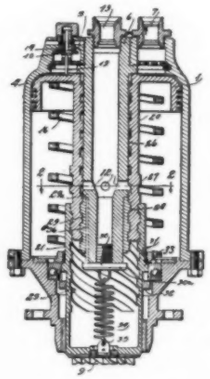
THE MAXIM SILENCER COMPANY

94 Homestead Ave. Hartford, Conn.

1. In a starting device of the kind described, a cylindrical casing having a fixed end, a centrally disposed hollow cylindrical guide shaft fixed at one end to the center of the fixed end and projecting toward the opposite end of the cylinder, steeply pitched spiral threads on the free end portion of the exterior of the guide shaft, a piston fitting in said cylinder and having an elongated hub forming a sleeve, said sleeve having internal grooves engaging said threads, a driven shaft actuated by the move-



ment of said sleeve, said guide shaft having a smoothly cylindrical portion extending from the fixed head to said threaded portion to effect smooth guidance of the piston and to prevent escape of gas between the piston and sleeve, and means to limit movement of the piston by pressure of fluid admitted between the fixed head and piston and comprising ports in said guide shaft opening into the hollow interior thereof, said ports being uncovered by said piston adjacent the end of the stroke thereof.

2,236,950

TWO-STROKE INTERNAL COMBUSTION ENGINE OPERATING WITH COMPRESSION IGNITION

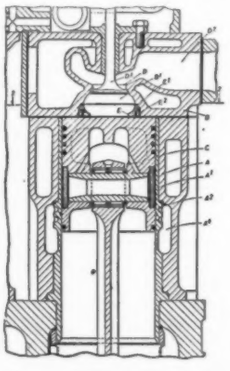
Harry Ralph Ricardo, London, England

Application Nov. 1, 1939, Serial No. 302,412

In Great Britain October 13, 1938

3 Claims. (Cl. 123-32)

1. In a two-stroke internal combustion engine operating with compression ignition, the combination of a cylinder, a piston adapted to reciprocate therein, said cylinder having tan-



gential ports in the wall thereof controlled by said piston, a combustion chamber in the cylinder head into which at the end of the compression stroke of the piston substantially the whole of the air charge is forced, said combustion chamber being a figure of revolution about an axis which is parallel with the cylinder axis and having a depth measured in the direction of the axis of the order of one-third to one-half of the maximum diameter of the chamber, the chamber having a circular mouth concentric with the chamber axis and constituted by a passageway through which alone the chamber opens into the cylinder bore, an exhaust port with a seat for a poppet valve in the upper wall of the chamber opposite to and concentric with the mouth thereof, an inwardly directed annular flange-like heat storing lip in the said mouth giving to the latter a minimum diameter which is less than the maximum diameter of the chamber but not less than the maximum diameter of the exhaust port throat, and a fuel injector mounted in the cylinder head at the side of the combustion chamber with its nozzle in that chamber and adapted for delivering fuel along an axis tangential to a circle whose centre lies in the combustion chamber axis.

2,261,290

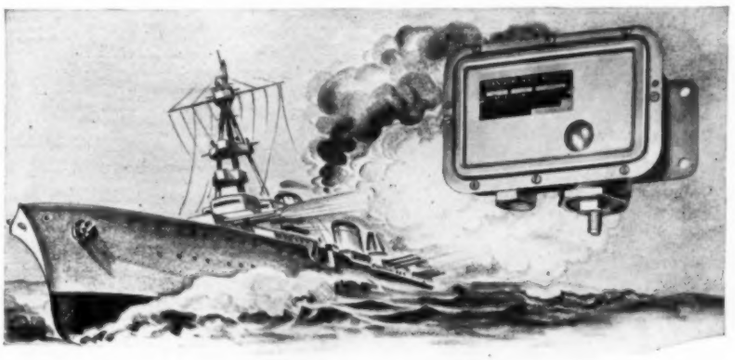
COMPRESSION-IGNITION ENGINE FUEL

Raphael Rosen, Elizabeth, N. J., assignor to Standard Oil Development Company, a corporation of Delaware.

No Drawing. Application December 22, 1938, Serial No. 247,219

5 Claims. (Cl. 44—9)

1. A fuel composition of compression-ignition engines of the Diesel type comprising a hydrocarbon Diesel fuel blended with a thiophosphate ester containing in the molecule three to four sulfur atoms and three organic groups each of which has an alkyl group, the hydrocarbon components of said fuel composition boiling below 700° F. and said ester being added in sufficient amount to substantially enhance the ignition quality of said fuel.



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The sturdily built switch mechanism is provided with large load and signal contacts to insure long, trouble-free service. The entire mechanism is housed within a heavy steel watertight case, having an easily removed cover to facilitate installation and adjustment. The cover is made tight by a heavy rubber gasket which is not affected by repeated removal and replacement of the cover. The power element is sealed with a rubber gasket and held in place by a threaded gland. Mounting and cover brackets are hydrogen welded to the case, thus insuring a waterproof enclosure.

Available for both temperature and pressure, these controls are used to stop the engine or give an alarm in the event that cooling water or bearing temperature becomes dangerously high or lubricating oil pressure drops below a safe minimum.

"DL" Heavy Duty Controls may be had in various temperature or pressure ranges.

For additional information, write for Bulletin No. 204

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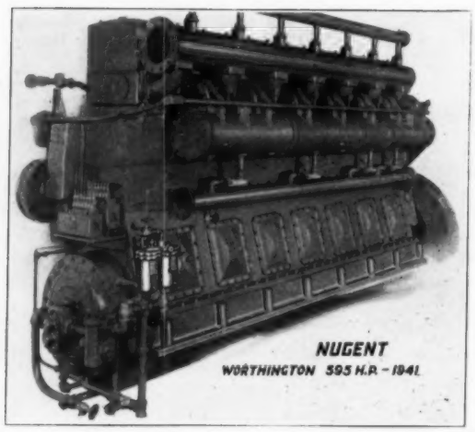

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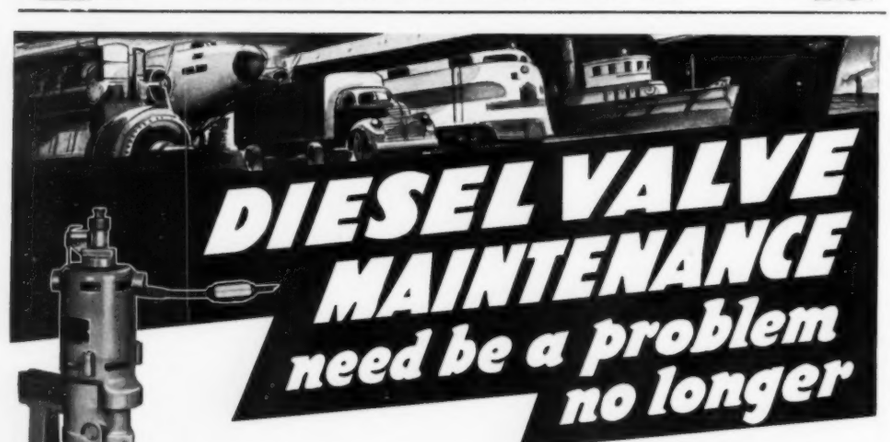

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2,243,011

INJECTOR FOR INTERNAL COMBUSTION ENGINES

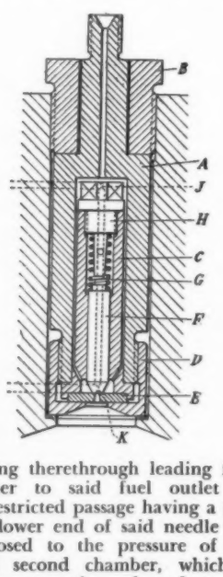
Prosper L'Orange, Stuttgart-Feuerbach, Germany; Rudolf L'Orange executor of the estate of said Prosper L'Orange, deceased.

Application Dec. 23, 1938, Serial No. 247,529

In Germany June 24, 1938

9 Claims. (Cl. 299—107.6)

1. An injection nozzle for internal combustion engines for effecting a preliminary injection of fuel followed by a main injection of fuel during each fuel injection operation and comprising a casing having an axially extending guide bore, a first chamber located above said guide bore and in communication therewith, a fuel inlet passage in communication with said first chamber through a restricted passage having a throttling action, a second chamber below said guide bore in communication therewith and with a fuel outlet opening at the lower end of said casing in communication with the engine cylinder, and a passage leading from said fuel inlet passage to said second chamber; a needle adapted to reciprocate within said guide bore and having a passage extending therethrough leading from said first chamber to said fuel outlet opening through a restricted passage having a throttling action, the lower end of said needle having a surface exposed to the pressure of the fuel within said second chamber, which surface terminates in a portion adapted to normally close communication between said second spring acting upon the upper end of the needle chamber and said fuel outlet opening, and a and tending to hold said needle in its normally closed position: the arrangement being such that when fuel under pressure is forced through the inlet passage in the casing a portion of said fuel passes through the restricted opening leading to the first chamber, through said first chamber, through the passage in the needle, through the restricted passage leading from said first chamber to the fuel outlet, through the fuel outlet opening in the casing and into the engine cylinder to constitute the preliminary injection of fuel thereto, and simultaneously with said preliminary injection, fuel is forced under pressure through the passage in the casing leading to said second chamber where said pressure acting upon the surface of said needle exposed within said second chamber is sufficient to lift said needle from said fuel outlet opening against the pressure of said spring, whereby the main fuel injection enters the engine cylinder.



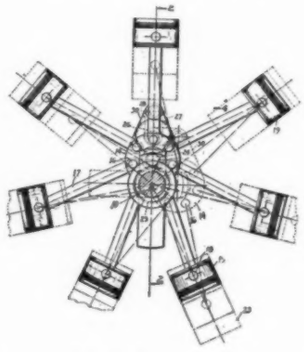
2,235,486

CONNECTING ROD STRUCTURE FOR ENGINES

Charles Lanier Lawrance, New York, N. Y., assignor to Lawrance Engineering and Research Corporation, Linden, N. J., a corporation of Delaware.

Application May 18, 1938, Serial No. 208,559

21 Claims. (Cl. 74—580)



1. In a multicylinder engine, a crankshaft having a crank pin, a spool member mounted on said crank pin, connecting rods for the several cylinders of the engine connected to said spool member, the places of connection between said rods and said spool member being equidistant from the center of the spool member, a rotatable member mounted to rotate about a center offset with respect to the crankshaft axis, motion transmitting mechanism connecting said rotatable member with said crankshaft and arranged to cause said rotatable member to rotate in the same direction as that of the crankshaft, and a motion transmitting connection between said rotatable member and said spool member, said connection connecting with said spool member at a place further from its center than the places of connection of said rods thereto.

2,260,252

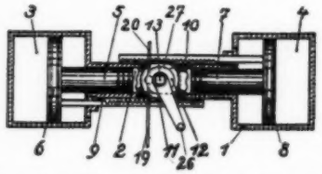
FREE PISTON ENGINE

Fritz John and Adolf Steinbecher, Munich-Allach, Germany, assignors to the firm Forschungsanstalt Prof. Junkers Gesellschaft mit beschrankter Haftung, Munich-Allach, Germany.

Application January 9, 1941, Serial No. 373,776

In Germany January 6, 1940

7 Claims. (Cl. 230—56)



1. In a free-flying piston engine the combination of a shaft, a gear for transforming rotary into reciprocating motion connecting said shaft with the flying piston, a hand crank adapted to be put on said shaft and to bring the flying piston into a position adapted to start the engine by gas under pressure, a source of compressed gas, a pipe connecting said source with the engine, and a displaceable member releasing from pressure, in its one position, the pipe connected with the engine, and, in its other position, effecting the blocking of the space for putting on the hand crank.

See pages 54 and 55 for details of the latest and the best book on Diesel Engines.

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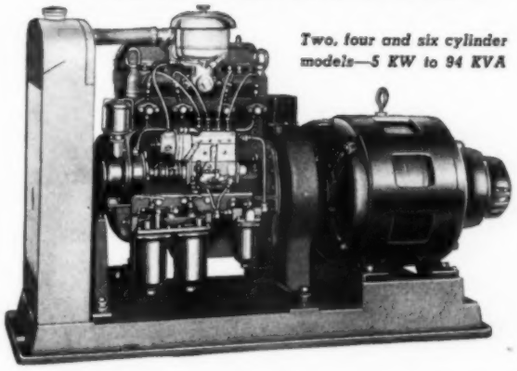
Quincy COMPRESSORS

BETTER PERFORMANCE



Two, four and six cylinder models—5 KW to 94 KVA

The U. S. Electric Plant you are going to install after the war will be an *even better* plant than the one you might have installed before the war. Reason: improvements evolving out of war production.

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PUMPS

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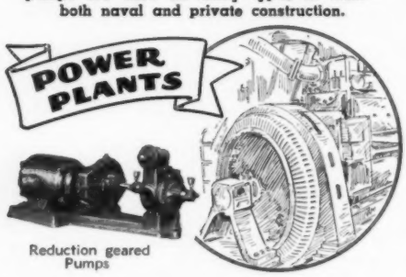
Standard units for vertical or horizontal mounting.

In Diesel fuel service on boats, where absolute dependability is so essential, Blackmer pumps are used on many types of craft—both naval and private construction.



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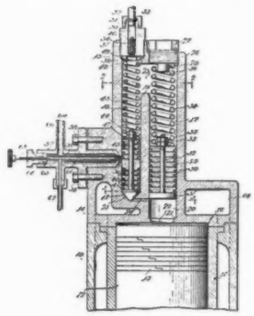
Write BLACKMER PUMP COMPANY
1968 Century Avenue, S.W.,
Grand Rapids, Michigan

BLACKMER Rotary PUMPS
"BUCKET DESIGN"—SELF-ADJUSTING FOR WEAR

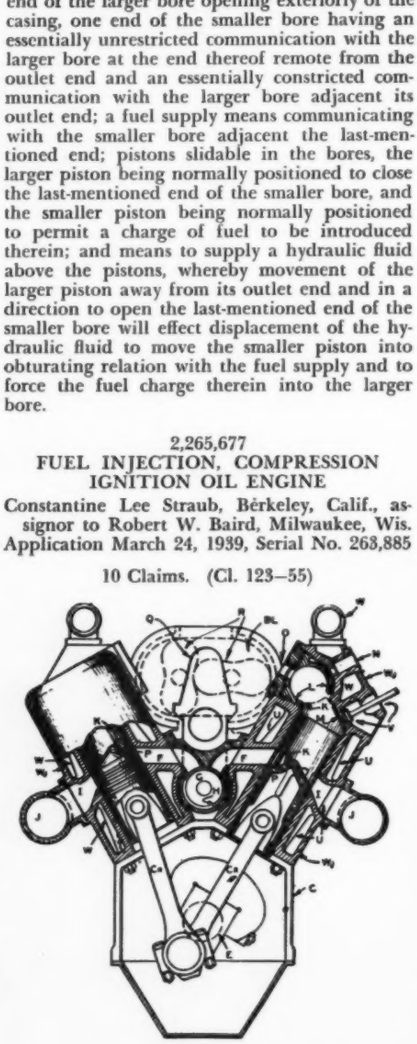
2,241,508
HYDRAULIC FUEL INJECTOR
John D. Fague, Philadelphia, Pa.
Application April 20, 1939, Serial No. 269,031
3 Claims. (Cl. 123—139)



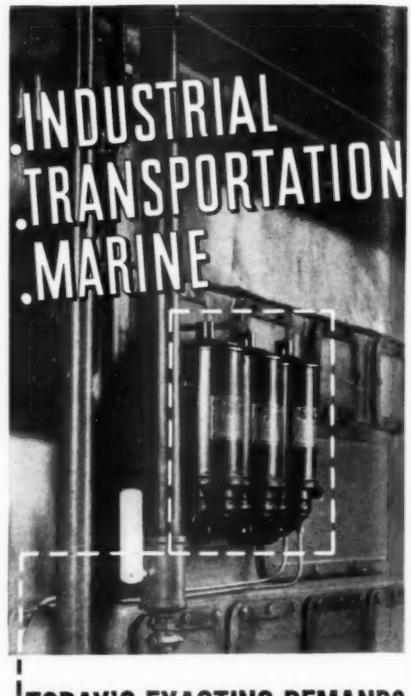
2. An injector comprising a casing having spaced parallel bores of unequal diameters, one end of the larger bore opening exteriorly of the casing, one end of the smaller bore having an essentially unrestricted communication with the larger bore at the end thereof remote from the outlet end and an essentially constricted communication with the larger bore adjacent its outlet end; a fuel supply means communicating with the smaller bore adjacent the last-mentioned end; pistons slidable in the bores, the larger piston being normally positioned to close the last-mentioned end of the smaller bore, and the smaller piston being normally positioned to permit a charge of fuel to be introduced therein; and means to supply a hydraulic fluid above the pistons, whereby movement of the larger piston away from its outlet end and in a direction to open the last-mentioned end of the smaller bore will effect displacement of the hydraulic fluid to move the smaller piston into obturating relation with the fuel supply and to force the fuel charge therein into the larger bore.

2,265,677
FUEL INJECTION, COMPRESSION IGNITION OIL ENGINE
Constantine Lee Straub, Berkeley, Calif., assignor to Robert W. Baird, Milwaukee, Wis.
Application March 24, 1939, Serial No. 263,885

10 Claims. (Cl. 123—55)



4. In a fuel injection, oil engine having a pair of cylinders with single acting pistons reciprocating therein and each connected to a common crank pin, the combination of inlet air and exhaust gas ports perforating the cylinder walls, the inlet air ports located in the upper or adja-



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DEMCO FUEL NOZZLE

★ Nozzles are made in three sizes, with flat seated needles of standard or non corrosive materials. No. 4 nozzle is self-cooling.

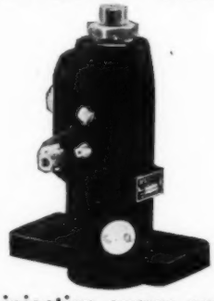
★ ★

DEMCO FUEL INJECTOR

★★ Fuel injectors are hydraulically operated, differential, closed type and are made in various lengths with three standard shank diameters.

★ ★ ★

DEMCO FUEL INJECTION PUMPS



★★★ "PH" fuel injection pumps are port controlled type; they are adaptable to a wide range of Diesels with minor adjustment of timing.

Send specifications with inquiries

DIESEL ENGINEERING & MANUFACTURING COMPANY

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cent walls of the two cylinders and the exhaust gas ports in the opposite walls of the respective cylinders, the lower edges of the ports in each cylinder on a common plane with the top of its piston operating therein when the latter is at, or near the end of its crankward travel; the upper edges of the inlet air ports, on a plane above the upper edges of its exhaust ports, a tubular air supply pipe common to both cylinders and connected with air ducts to the inlet ports of each cylinder and fitted with a tubular, single aperture valve revolving in unison with the said crank pin; the aperture of the said revolving valve arranged with reference to the ducts leading to the inlet air ports of each cylinder such that the angle of the arc traversed by the leading edge of valve aperture in uncovering each of the air ducts shall be equal to the angle included between the axes of the respective cylinders.

2,258,655

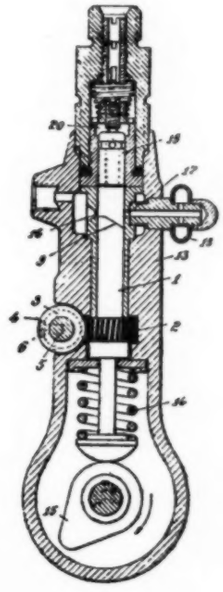
ADJUSTING DEVICE FOR FUEL INJECTION PUMPS

Heinz Links, Gaggenau, Germany, assignor to Daimler-Benz Aktiengesellschaft, Stuttgart, Germany.

Application September 24, 1940, Serial No. No. 358,110

In Germany October 2, 1939

8 Claims. (Cl. 103—41)



1. Single adjusting device for the plungers of a pump with several points of consumption, to be regulated jointly, comprising a cylinder with a corresponding plunger, the stroke volume being adjustable by means of rotating the plunger provided with a stop, the plunger being provided furthermore with a toothing which together with a toothing on the governor rod effects the rotation of the plunger, the toothing of the governor rod consisting of individual tooth elements arranged on the governor rod and individually adjustable independently of each other in respect to the latter in the form of liners, and finally means for effecting a finely adjustable and individual longitudinal displacement of the liners on the governor rod and furthermore a fixing in each position.

Volume Seven of the Diesel Engine Catalog came off the press on July 31. See pages 54 and 55.

Bring 'em back to life...

★ Any Gas or Diesel Engine that you now have (regardless of its condition) will probably have to last for the duration. The chances of replacing it, or even overhauling it, are slim. Almost all new engines and parts are now being used for War Equipment and War Machines.

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As the Honan-Crane Purifier removes the contamination from the oil in service, the clean oil begins to gather dirt and contamination that had previously been deposited in the engine.

Pure mineral oil is the best solvent to remove these accumulations of sludge and varnishes that have been deposited in an engine. Removal of this contamination soon cleans up the engine—frees rings and bearings and restores the original efficiency. A single refill will remove as much as 295 pounds of contamination from a 1000 H. P. engine.

2. *Prevents further excessive wear.*

After all of the contamination has been removed from your engines a Honan-Crane *"Continuous"* Oil Purifier will keep the engines perfectly clean and operating at all times on clean, fresh oil. All contamination is removed as fast as it is liberated. This perfect lubrication will prevent excessive wear, extend the life of all parts and keep the operating efficiency of the engine at its highest level.

3. *Save oil . . . The use of a Honan-Crane "Continuous" Oil Purifier will safely extend the life of your lubricating oil.*

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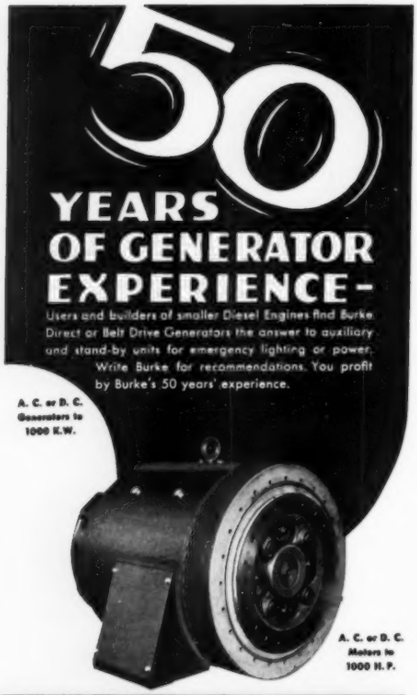
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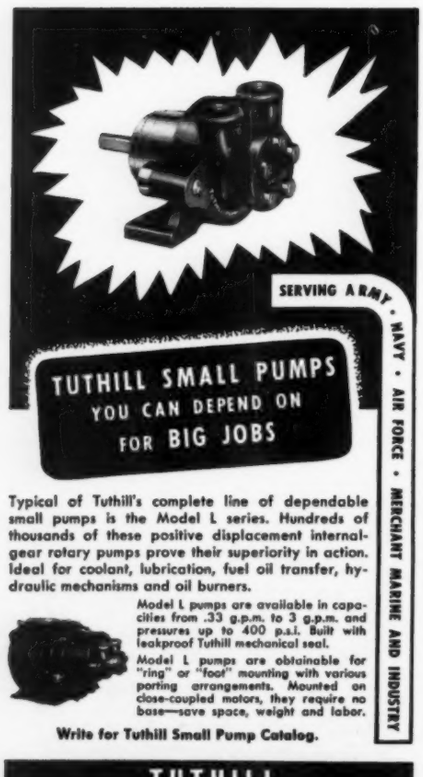
BURKE ELECTRIC CO Erie, Pa.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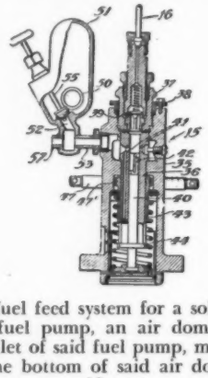
Reserve YOUR copy of the new Diesel Engine Catalog. Use the convenient coupon on page fifty-five.

2,236,821

SOLID INJECTION ENGINE

Emil Grieshaber, Milwaukee, Wis, assignor to Nordberg Manufacturing Company, Milwaukee, Wis., a corporation of Wisconsin.

Application Jan. 12, 1939, Serial No. 250,484
7 Claims. (Cl. 123—139)



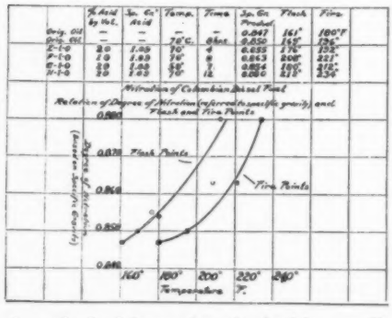
1. In a fuel feed system for a solid injection engine, a fuel pump, an air dome connected with the inlet of said fuel pump, means to lead oil from the bottom of said air dome and deliver the same to said pump, a control valve in said means, to shut off the flow of oil therethrough, and a supply pipe opening into said air dome to supply oil thereto.

2,240,558

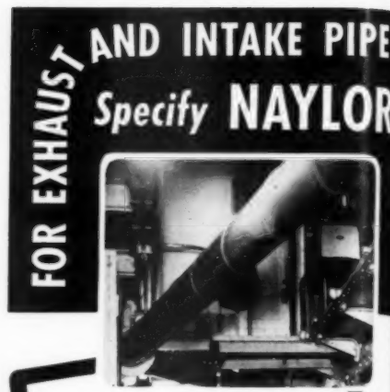
NITRATED DIESEL FUEL AND PROCESS OF MAKING SAME

Carleton Ellis, Montclair, N. J., assignor to Standard Oil Development Company, a corpotation of Delaware.

Application February 7, 1936, Serial No. 62,759
1 Claim. (Cl. 44—9)



A method of improving the ignition quality of a Diesel fuel for more efficient combustion in a compression-ignition engine, which comprises mixing a petroleum distillate Diesel oil having a higher boiling range than gasoline and a cetane number higher than about 44 with dilute nitric acid of specific gravity from about 1.09 to about 1.37 in proportions ranging from about equal volumes of the Diesel oil and acid to 5 volumes of the Diesel oil to 1 volume of the acid, maintaining the resulting mixture at a temperature below 100° C. for a period adequate to form oil-soluble nitrated derivatives from some of the oil components without substantial oxidation of the oil to acidic bodies and to form less than about 1% of sludge impurities, said nitration being limited to materially increase the nitrogen content of the oil by about 0.06 to 0.42% through the formation of said nitrated derivatives, and thereafter recovering the treated oil containing said nitrated derivatives in solution by separation of any excess spent nitrating agent therefrom.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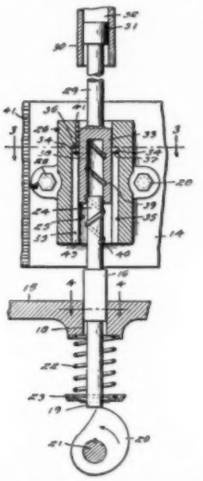
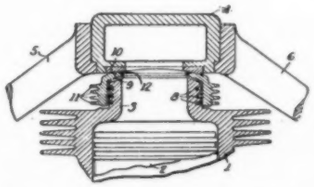
NEW YORK CITY

2,239,884
VARIABLE PUSH ROD FOR DIESEL INJECTORS
Lawrence J. Deeley, Blossvale, N. Y.
Application April 23, 1940, Serial No. 331,250
7 Claims. (Cl. 103—38)



1. In a fuel pump construction, a rotating cam, a push rod reciprocally actuated by the cam, a plunger arranged axially of the push rod and having a recess opening through its lower end to screw-threadedly receive the upper end of the said push rod, and a casing having a bore for reciprocally accommodating the plunger, the said bore having longitudinal grooves adapted to slidably receive trunnions formed on the plunger, which longitudinal groove disposed adjacent the upper end of the bore, said plunger being normally held in fixed association with the push rod by engagement of the trunnions within the longitudinal grooves but adapted to rotate relative thereto upon movement of the trunnions into register with the said annular groove.

2,258,649
INTERNAL COMBUSTION ENGINE
Rudolf Hasenzahl, Dessau, Germany, assignor to Gotthard Sachsenberg, Zentralgesellschaft mit beschrankter Haftung, Berlin, Germany, a German society.
Application February 4, 1939, Serial No. 254,577
In Germany February 5, 1938
3 Claims. (Cl. 123—44)



1. In an internal combustion engine having cylinders arranged in star shape, a port in the head of each of the cylinders arranged in a reduced neck portion thereof, an annular slide valve having ports herein for controlling the intake and exhaust of said cylinders, packing means including exterior cooling ribs and an inwardly turned flange with an annular surface adapted to engage the seat surface of said slide valve, said packing means being slidably disposed on exterior guiding surfaces of said neck portion, and means for protecting the inner edge of said annular flange surface from the direct attack by combustion gases, the inner surface of said neck portion being freely exposed to the action of the combustion gases without parts or portions of the packing means covering said surface or substantial parts thereof.

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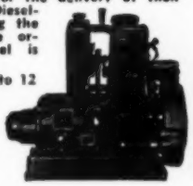

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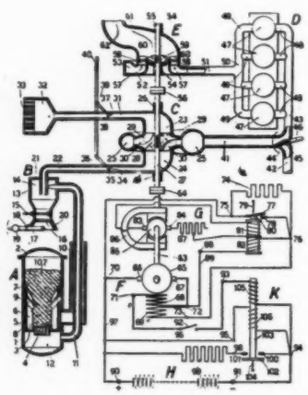
PITTSBURGH, PENNA.

2,263,234
DIESEL FUEL
Gould H. Cloud, Linden, N. J., assignor to Standard Oil Development Company, a corporation of Delaware.
No Drawing. Application March 1, 1940, Serial No. 321,718
8 Claims. (Cl. 44—9)

1. A high speed Diesel fuel comprising a hydrocarbon Diesel fuel blended with a minor quantity of an alkyl trisulfide in sufficient amount to improve the ignition quality of the fuel.

2,263,370
INTERNAL COMBUSTION ENGINE INSTALLATION
Hesper von Tavel, Soleure, Switzerland, assignor to Scintilla Ltd., Soleure, Switzerland, a corporation of Switzerland.
Application April 16, 1940, Serial No. 329,963
In Switzerland April 22, 1939
7 Claims. (Cl. 290—4)



1. In combination an internal combustion engine; a turbine having its intake connected to the exhaust of said internal combustion engine; a blower for delivering air and fuel to said internal combustion engine; a dynamo electric machine suitable for working either as a generator or as a motor and having an armature conductor system and at least one exciter conductor system; driving connections between said turbine, blower and dynamo electric machine; a storage battery; a main circuit including the said battery and the armature conductor system of said dynamo machine; an exciter circuit including the said exciter conductor system of said dynamo machine; and a current regulator connected in said exciter circuit, and responsive to the speed of said blower for admitting current of increased average intensity through the said exciter circuit when the speed of the blower increases.

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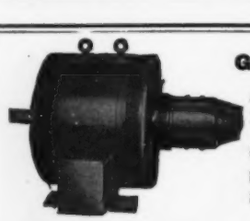
AMERICAN BOSCH CORPORATION
SPRINGFIELD, MASSACHUSETTS



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For Diesel and gasoline engine drive

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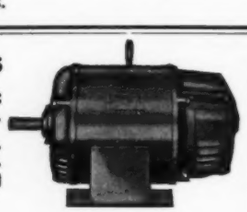

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EX-CELL-O CORPORATION
Diesel Division *Detroit Michigan*
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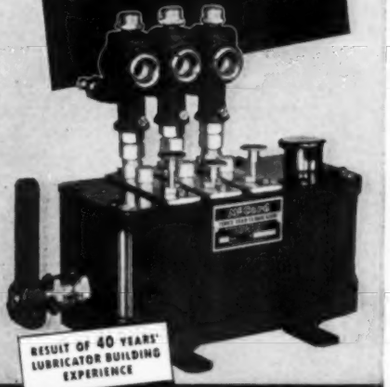

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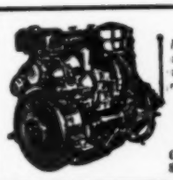

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Fresh water cooling is standard

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ANY QUANTITY—7½ to 50 KW, 125 v. or 250 v. direct connected vertical type engine generator sets.
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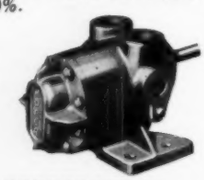
Ask for Catalog 935



GEO. D. ROPER CORPORATION
ROCKFORD, ILLINOIS

ROPER Rotary PUMPS

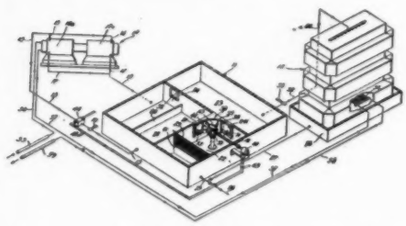
2,258,089

CONTROL SYSTEM FOR ENGINE COOLING WATER

William E. Dunn, Kansas City, Mo., assignor to The Fluor Corporation, Ltd., Los Angeles, Calif., a corporation of California.

Application March 5, 1941, Serial No. 381,816

18 Claims. (Cl. 123—174)



5. A system for supplying an engine with controlled temperature cooling water, comprising a reservoir receiving hot water from the engine, a well containing relatively cool tempering water, a sump into which water flows by gravity from said well, means maintaining a gravity flow of water from said reservoir into the sump, means diverting a gravity flow of water from said well into the reservoir, a pump for discharging the mixed waters from the reservoir to the engine, a valve for controlling the rate of tempering water flow from said well to the reservoir in accordance with a predetermined temperature of said mixed water stream, a water cooling tower, and means for passing water from said sump through the cooling tower and for returning the cooled water to said well.

Volume Seven of the Diesel Engine Catalog came off the press on July 31. **See pages 54 and 55.**

2,270,127

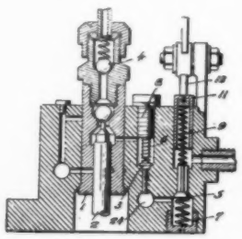
ARRANGEMENT FOR REGULATING THE OUTPUT OF FUEL PUMPS FOR INTERNAL COMBUSTION ENGINES

Arthur Kravits, Budapest, Hungary, assignor of one-half to Aurel Nemes, Budapest, Hungary.

Application March 7, 1939, Serial No. 260,256

In Germany March 29, 1938

3 Claims. (Cl. 103—37)



1. In a fuel feeding device comprising a plurality of fuel pump cylinders, a throttling member provided in the section of the fuel admission channel common to all the pump cylinders and secondary throttling members consisting of spring loaded non-return valves inserted between said master throttling member and the admission apertures of said pump cylinders, the secondary throttling members being submitted to a spring load at least so large that the largest cross-sectional area of said secondary throttling members even in fully open state of the master throttling member be smaller than the smallest passage between said master throttling member and the several pump cylinders.

2,267,109

MANUFACTURE OF DIESEL FUEL

Marcus T. Kendall, Long Beach, Calif., assignor by mesne assignments to The Texas Company, New York, N. Y., a corporation of Delaware.

No Drawing. Application June 3, 1939, Serial No. 277,257

4 Claims. (Cl. 196—41)

1. A method of treating a petroleum distillate fraction boiling approximately within the range 400° to 750° F. to stabilize it and inhibit increase in residual carbon content to thereby produce a stable Diesel fuel, which comprises subjecting the distillate within not more than about 72 hours after it has been distilled from the crude petroleum to contact with fresh unused aqueous caustic soda solution of about 3 to 10° Be. gravity and at a temperature within the range 120° to 140° F.

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New York City

Owners—Spearin, Preston & Burrows, New York.

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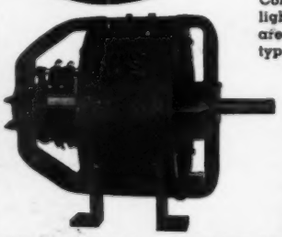
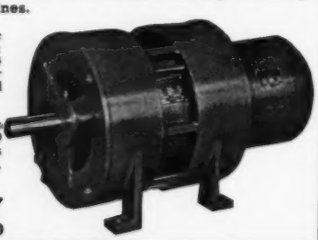
A. C. AND D. C. GENERATORS

Columbia A.C. and D.C. Generators are designed and widely used for light and power service and are ideal for use as ship auxiliaries. They are light in weight, compact and can be furnished in single bearing type for direct connection to engines.



A.C. Generator sizes range from 6¼ to 300 KVA. Speeds: 1800, 1200, 900, 720, 600, 514 and 450 R.P.M. Single or three phase; direct connected or belted exciters.

Columbia D.C. Generators range in size from 7½ to 200 KW, 36, 60, 125 and 250 volts and in speeds of 1750, 1450, 1150 and 850 R.P.M.



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